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NOV 79 R E RAY, M D DICKEY, A M LYLES

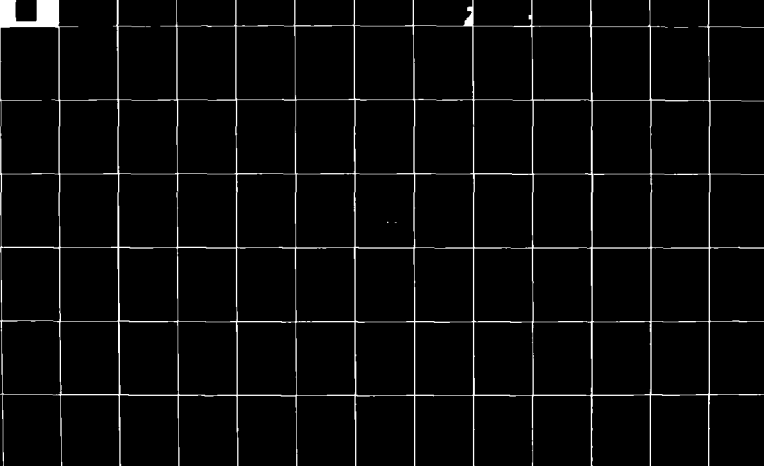
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APP. TO MR-79-6 VOL  
APP

**An Annotated Bibliography of Patents  
Related to Coastal Engineering.**

VOLUME III, 1974-1977

by

Robert E./Ray, Michael D./Dickey, and Annie M./Lyles

APPENDIX TO MISCELLANEOUS REPORT NO. 79-6

11) NOVEMBER 1979

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)  Bibliography                      Coastal engineering                      Patents		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This appendix presents a three-volume collection of patents on coastal engineering issued by the U.S. Patent Office from 1967 to 1976. Topics include coastal structures and structural components, structure protection and maintenance, construction methods and equipment, field research and survey instruments, hydraulic laboratory modeling equipment, marine pollution control apparatus, and ocean energy extraction devices. Abstracts and annotations for 2,468 patents are given in the three volumes covering the periods 1967 to 1970 (Vol. I), 1971 to 1973 (Vol. II), and 1974 to 1976 (Vol. III). Also included in each volume are a list of patent titles and numbers, and an index by keywords. Explanatory information on the overall collection and its use, abstracted from MR 79-6, is given in Volume I.		

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AN ANNOTATED BIBLIOGRAPHY  
OF  
PATENTS RELATED TO COASTAL ENGINEERING  
VOLUME III: 1974-76

by  
*Robert E. Ray, Michael D. Dickey,*  
and  
*Armie M. Lyles*

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# I. TITLE LIST, 1974-76

- 37 1117 METHOD AND APPARATUS FOR DREDGING FOUNDATIONS  
UNDER SUBMERGED STRUCTURES
- 371118 APPARATUS FOR DREDGING, DIVING AND RECOVERING A SUBMERGIBLE BODY  
FROM A VESSEL
- 371119 DREDGING METHOD
- 371120 METHOD FOR DREDGING
- 371121 METHOD AND APPARATUS FOR THE DREDGING OF OIL FROM WATER
- 371122 METHOD AND APPARATUS FOR DREDGING OF PETROLEUM PRODUCTS
- 37 1123 METHOD AND APPARATUS FOR DREDGING WASTE WATERS INTO ELECTRIC ENERGY
- 37 1124 METHOD AND APPARATUS
- 371125 METHOD AND APPARATUS FOR DREDGING FLOATING ON WATER
- 371126 METHOD AND APPARATUS FOR THE CONTAINMENT AND SALVAGE OF OILS AND  
OILS AT SEA
- 37 1127 METHOD AND APPARATUS FOR FOUNDING A STRUCTURE
- 371128 METHOD AND APPARATUS FOR COLLECTING OIL FROM THE SURFACE OF A BODY  
OF WATER
- 37 1129 HYDRAULIC ENGINEERING INSTALLATIONS
- 371130 ATTENUATION OF WATER WAVES AND CONTROL AND UTILISATION  
OF WAVE-INDUCED WATER MOVEMENTS
- 371131 WAVE FORCE REDUCERS
- 371132 OIL DREDGING DEVICE FOR REMOVING OIL FROM THE SURFACE OF WATER
- 371133 METHOD FOR ANTI-CORROSION PROTECTION BY REDUCTION OF IONIZED METALS  
ON METAL SURFACES
- 37 1134 DREDGING AND REMOVING OIL FROM THE SURFACE OF WATER
- 371135 METHOD AND APPARATUS FOR OFFSHORE GEOPHYSICAL EXPLORATION  
WITH LOW POWER SEISMIC SOURCE
- 371136 OIL DREDGE
- 371137 DREDGE BARGE AND PUMP UNIT
- 371138 METHOD AND APPARATUS FOR DREDGING SLOPED CONCRETE SLOPE STRUCTURES
- 37 1139 METHOD AND APPARATUS FOR DREDGING SUBMERGED SLOPED STRUCTURES
- 37 1140 METHOD AND APPARATUS FOR DREDGING METHOD AND APPARATUS
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- 371199 METHOD AND APPARATUS FOR DREDGING METHOD AND APPARATUS

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3644122 PROTECTED OFFSHORE STORAGE FACILITY  
 3644123 DEVICE FOR PROTECTING AND PROTECTING DEPOSITS OF SEDIMENTARY MATERIAL  
 ON THE FLOOR OF BODIES OF WATER  
 3644124 CONTROL OF BRIDGE  
 3644125 ANTI-DEPOSITION DEVICE  
 3644126 USE OF WIND AND CURRENTS IN CRUISES  
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3094241 WAVE ACTION POWER SOURCE  
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 3910213 PROPELLANT-ACTUATED FINE WATER ANCHOR  
 3911007 WAVE DRIVEN POWER GENERATORS  
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 3918263 TOWER  
 3918267 FUEL LESS WATER PUMPING MACHINE  
 3918268 TREATMENT OF FLOATING POLLUTANTS  
 3918269 UNDERWATER SEISMIC SOURCE AND METHOD  
 3918270 FUSION CUSHION DREDGE AND DREDGE COMBINATION  
 3918271 DREDGE HAVING SEPARATELY FLOATING DREDGE AND TAIL SECTIONS AND METHOD  
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 3918647 FLOATING ANTI-POLLUTION BARRIER  
 3920083 PILE DRIVING AND DRAWING APPARATUS  
 3920137 EXCAVATING MACHINE WITH CLIMBABLE BUCKET  
 3921124 MARINE A-D SEISMIC METHOD USING SOURCE POSITION CONTROL  
 3921125 COAXIAL ELECTRET HYDROPHONE  
 3921238 SPONGE PIPE FLOTATION  
 3921407 OIL SPILL CONTAINMENT BOOM  
 3921408 ANTI-WAVE PROTECTIVE SYSTEM  
 3922225 SEA-WATER OIL SPILL CLEANING SYSTEM  
 3922739 APPARATUS FOR CONVERTING SEA WAVE ENERGY INTO ELECTRICAL ENERGY  
 3922860 FLOATING BOOM HAVING ROTATABLE FLOAT ELEMENTS  
 3922861 FLOATING MARINE BARRIER  
 3922862 FLOATING CONTAINING VESSELS OF DAMS FOR TRAPPING LIQUID POLLUTANTS  
 3922865 MATTRESS, METHOD OF SINKING A MATTRESS AND VESSEL SUITABLE FOR USE  
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 3922868 DEEP WATER PLATFORM CONSTRUCTION  
 3922869 PUMPED EVACUATED TUBE WATER PUMPING PILE DRIVER METHOD  
 3923122 SEISMIC PNEUMATIC ENERGY SOURCE WITH ATTENUATION OF PULSE  
 AMPLITUDE AND REDUCTION OF PERIOD OF PULSE OSCILLATION  
 3923661 OIL SKIMMER WITH LEAD FLOAT AND WIPED WIRE  
 3924256 DIGITAL DEPTH COUNTER  
 3924412 OIL CONTAINMENT BOOM  
 3924413 FITTINGS AND THE LIKE FOR PIPE PILING  
 3924414 PILE FOR USE IN OFFSHORE AREAS HAVING A SHIFTING LAYER OF MUD  
 3924415 AIR CUSHION DREDGE FOR USE IN ICE-COVERED WATERS  
 3925091 FLOATING OIL TREC  
 3925097 BREAKWATER DEVICE FOR OFFSHORE SUBMERGED FOUNDATION STRUCTURES  
 3926003 BUOYANCY AND ATTITUDE CORRECTION METHOD AND APPARATUS

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3943724 UNDERWATER STATICARY TANK FOR STORING LARGE AMOUNTS OF CRUDE OIL  
 3944019 DEEP WATER SOUND IMPOSED  
 3945137 FRAME FOR CATCHING REMOVAL MOVEMENTS, ESPECIALLY FOR GRAP BUCKETS  
 OF HYDRAULICALLY OPERABLE EARTH EPPDSES  
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 RE28232 METHODS OF GROUTING OFFSHORE STRUCTURES  
 RE28332 METHOD AND APPARATUS FOR PREVENTING ICE DAMAGE TO MARINE STRUCTURES  
 RE28966 SYSTEM AND BARRIER FOR CONTAINING AN OIL SPILL  
 RE28978 FAIL-SAFE SUBSEA FLUID TRANSPORTATION SYSTEM  
 RE28989 ELECTROMAGNETIC WATER CURRENT METER

## II. ANNOTATED BIBLIOGRAPHY, 1974-76

1. 1974

3,782,127 to 3,857,651

JANUARY 1, 1974

3,782,127

### METHOD AND APPARATUS FOR DEPOSITING FOUNDATIONS UNDER SUBMERGED STRUCTURES

Kaare Ritter Olsen, 80 Selkirk Crescent, Hudson, Quebec, Canada

Filed June 12, 1972, Ser. No. 261,655

Int. Cl. E02d 27/52

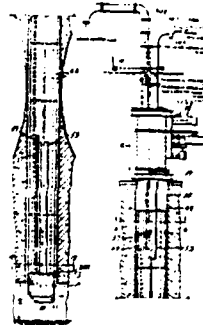
U.S. Cl. 61-50

8 Claims

The disclosure teaches a novel method for depositing foundation-providing sand under structures submerged in water, such as underwater tunnels, as well as apparatus for carrying out the method. In accordance with the teachings, the structure contains an opening extending from the top to the bottom of the structure. An arrangement comprising sand-jetting means and water suction means are extended through the opening from the top such that the jetting and suction means extend beyond the base of the structure. The jetting means is rotatable through 360°. Sand is jetted through the arrangement while water under the structure is simultaneously removed by the suction means whereby a bank of sand is built up under the structure. The jetting means is aimed slightly above the horizontal.

Keywords: Offshore construction; Seabed foundation; Seabed material placement

U.S. Cl. X.R. 61-63; 302-16; 302-66



3,782,319

### APPARATUS FOR LAUNCHING, TOWING AND RECOVERING A SUBMERSIBLE BODY FROM A VESSEL

Neville E. Hale, Mississauga, Ontario, Canada, assignor to Fathom Oceanology Limited, Port Credit, Ontario, Canada

Filed Jan. 26, 1973, Ser. No. 327,003

Claims priority, application Canada, Feb. 29, 1972, 135768

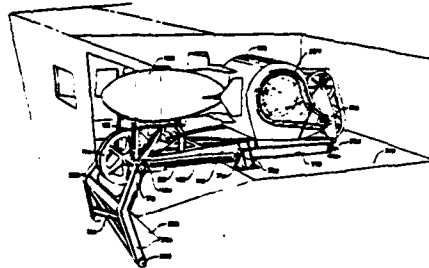
Int. Cl. B63b 21/00

U.S. Cl. 114-235 B

12 Claims

Apparatus for launching, towing and recovering a submersible and towable body from a vessel includes a saddle, a winch and cable spooling and tension apparatus. The saddle includes a roller box which is rotatable about the axis of the tow sheave to maintain constant pressure against the cable during towing. A skewable A-frame for lowering the saddle near the water surface includes a transom arm which is pivotally mounted to the transom and to the tow sheave. The winch may be a multi-drum assembly, where the drums are co-axially mounted; and the drums are rotatably mounted in peripheral bearings at each end, which are mounted in the ends of the winch enclosure. The winch enclosure has a cover plate with a transverse slot to permit reeling and unreeling of cable from a drum. A latch mechanism provides for positive locking of a drum for rotation or non-rotation, depending on whether it or another drum is the one on which cable is being reeled or unreeling. The drums of a multi-drum assembly also have a transverse slot formed in them; and the lips of each slot are profiled to turn inwardly with a smaller apparent radius of curvature than the nominal radius of the drum.

Keywords: Instrument deployment; Instrument retrieval; Tow winch control



3,782,483

**PERCUSSION HAMMER**

George C. Wandell, Soddy, Tenn., assignor to Vulcan Iron Works Inc., Chattanooga, Tenn.

Filed Nov. 15, 1971, Ser. No. 198,923

Int. Cl. E02d 7/10

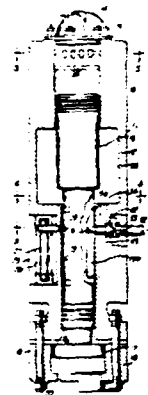
U.S. Cl. 173-15

3 Claims

There is provided a percussion hammer of the type used for driving piles and the like, and including a differential diameter piston defining a ram reciprocally positioned within a differential diameter cylinder. An anvil is mounted for limited movement in one end of the cylinder positioned in the path of the ram to receive percussion blows therefrom. Main valve means are provided for controlling the working fluid so as to cycle the ram through power and return strokes. Safety means are provided for shutting off the supply of working fluid rendering the ram inoperative when the percussion hammer is out of engagement with a pile.

Keywords: File driver, impact

U.S. Cl. X.R. 173-133



3,782,553

**LIGHT LIQUID SKIMMER**

Carroll E. Brekke, 2229 Parkland Way, Petaluma, Calif.

Filed May 3, 1972, Ser. No. 249,863

Int. Cl. E02b 15/04

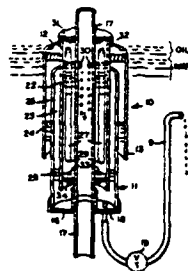
U.S. Cl. 210-242

7 Claims

A light liquid skimmer employs an air seal piston having skim slots on the upper end thereof and a flow through vessel, said piston being moveable with respect to said vessel, to skim a light liquid from a heavy liquid. The position of the skim slots moves upwardly or downwardly as the proportion of light liquid decreases or increases, respectively. The adjustment is accomplished by the movement of the air seal piston with respect to the flow through vessel due to the adjustment in buoyancy of the air seal piston as the weight of the liquid in the flow through vessel varies and thereby changes the configuration of the air seal between the air seal piston and flow through vessel. Skimmed liquid flows downwardly through intake conduits within the air seal piston and flow through vessel and is introduced to the mixture of liquid within the flow through vessel in the lower region thereof. The light liquid rises within said flow through vessel and is recovered through light liquid recovery slots configured in a light liquid recovery tube positioned within the vessel. The heavy liquid continues to flow downwardly and is discharged through a heavy liquid discharge orifice at the bottom of the flow through vessel.

Keywords: Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.21



3,783,129

**METHOD OF AND APPARATUS FOR THE  
RECOVERY OF OIL FROM WATER**

Clinton O. Bunn, Denver, Colo., assignor to Col-Mont  
Corporation, Butte, Mont.

Filed Mar. 4, 1971, Ser. No. 121,000

Int. Cl. E02b 15/04

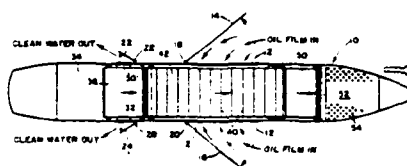
U.S. Cl. 210-30

17 Claims

A matrix material is provided for recovering oil from water comprised of finely divided coal particles bonded in spaced relation by polyethylene. The oil sorption capability of the matrix is exceptionally high and the matrix is highly selective to oil in the presence of oil and water. A closed system is provided for forming the matrix material and for separating the sorbed oil from the matrix material for reuse of the latter. The matrix material can be in the form of a fixed or movable bed through which the oil and water pass for selective sorption of the oil, or the material can be dispersed on the water surface and collected following oil sorption.

Keywords: Pollutant absorption; Pollutant, mechanical removal; Pollutant removal watercraft

U.S. Cl. X.R. 210-40; 210-DIG.21



3,783,284

**METHOD AND APPARATUS FOR DETECTION OF  
PETROLEUM PRODUCTS**

Kent McCormack, Richardson, Tex., assignor to Texas Instru-  
ments Incorporated, Dallas, Tex.

Filed Oct. 28, 1971, Ser. No. 193,439

Int. Cl. G01n 21/34

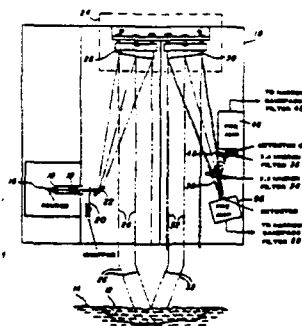
U.S. Cl. 250-339

17 Claims

Disclosed is a method and apparatus for indicating the presence or absence of petroleum products in a water area by utilizing an active infrared source which illuminates the water area which may contain a petroleum product. The reflected infrared radiation is filtered by two filters at two different wavelengths,  $\lambda_1$  and  $\lambda_2$ . Two infrared detectors produce signals which are proportional to the detected reflected radiation at the wavelengths  $\lambda_1$  and  $\lambda_2$ . A processing channel is connected to each detector, the processing channels each including a log amplifier, the output of which is coupled to a differencing circuit which produces an output signature signal,  $\ln [V(\lambda_1)/V(\lambda_2)]$ , which indicates either the presence or absence of the petroleum products in the water area.

Keywords: Instrument, airborne; Instrument, laser; Pollutant measurement

U.S. Cl. X.R. 250-301; 250-341; 250-345; 250-504



3,783,302  
**APPARATUS AND METHOD FOR CONVERTING WAVE  
 ENERGY INTO ELECTRICAL ENERGY**  
 David D. Woodbridge, P.O. Box 1425, Melbourne, Fla.  
 Filed Apr. 6, 1972, Ser. No. 241,702  
 Int. Cl. F03b 13/12

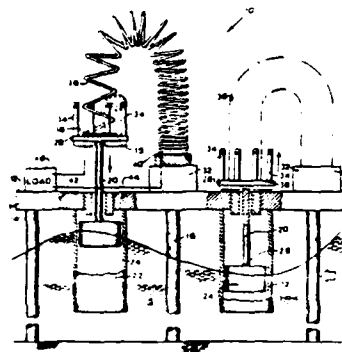
U.S. Cl. 290-42

14 Claims

Apparatus including a coil supported on one end by a platform which reciprocates in response to wave action on a body of water. A magnetic field is provided through the coil so that an electromotive force is generated therein due to motion of the coil in the magnetic field.

Keywords: Electrical generator; Power, wave

U.S. Cl. X.R. 290-53; 310-15; 310-12;  
 310-36



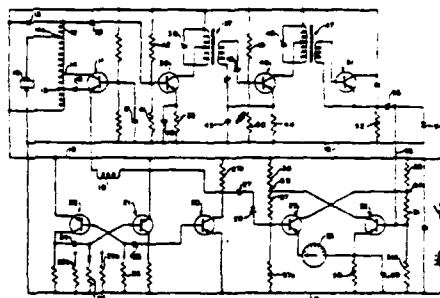
3,783,442  
**DEPTH SOUNDER**  
 George Feinman, Whitestone, N.Y., and Richard Haven, Long  
 Branch, N.J., assignors to Andrea Radio Corporation, Long  
 Island City, N.Y.  
 Filed Apr. 10, 1972, Ser. No. 242,421  
 Int. Cl. G01s 9/68

U.S. Cl. 340-3 R

13 Claims

A depth sounding instrument including an oscillator for supplying AC energy to a transducer. The oscillator is keyed on by a multivibrator which produces clock pulses. Each clock pulse switches the state of a flip flop and starts a time measuring interval each time a clock pulse is supplied to the oscillator. A receiver receives the reflected sonic energy and terminates the time measuring interval of the flip-flop. A meter responds to the measured time interval to provide a visual indication of the depth from which energy was reflected.

Keywords: Sonar, depth sounder



JANUARY 8, 1974

3,783,621  
**CONVERTIBLE BARRIER FOR SUBSTANCES FLOATING  
 ON WATER**

Paul Preus, P.O. Box 1002, Toms River, N.J., and John J. Gal-  
 lagher, 252 Burley Rd., Annapolis, Md.

Division of Ser. No. 137,799, Apr. 27, 1971, Pat. No. 3,667,235  
 Filed June 5, 1972, Ser. No. 259,559

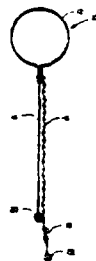
Int. Cl. E02b 15/04

U.S. Cl. 61-1 F

2 Claims

A barrier for substances floating on water having a flotation member and a liquid pervious and a liquid impervious skirt depending therefrom. The liquid impervious skirt is deflected at currents greater than about one knot and the oily substances are treated with a particulate oleophilic-hydrophobic substance less dense than water for retention by said liquid pervious skirt.

Keywords: Pollutant absorption; Pollutant, surface barrier



3,783,622  
**METHOD AND SYSTEM FOR THE CONTAINMENT AND  
 SALVAGE OF CHEMICALS AND OILS AT SEA**

Charles L. Gambel, 3500 Monticello Ave., New Orleans, La.

Filed Sept. 16, 1971, Ser. No. 181,162

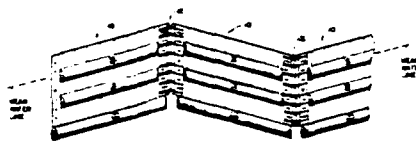
Int. Cl. E02b 15/04

U.S. Cl. 61-1 F

14 Claims

A rigid barrier unit for use in assembling an enclosure around a surface area of a body of water is provided with adjustable buoyancy and ballasting chambers so that a nearly neutral buoyancy condition can be established with substantially all of the mass of the unit below the turbulence level of a body of water in which the barrier unit is placed. A method of deployment of such units involves a flotation of the units in horizontal attitudes to the area to be enclosed, followed by a ballasting of the units into vertical attitudes so as to extend around an oil or chemical spill area.

Keywords: Pollutant, surface barrier



3,783,626  
**STRUCTURE, AND METHOD AND APPARATUS FOR  
 FOUNDING A STRUCTURE**

Frode Johan Hansen, Kingswood, England, assignor to  
 Redpath Dorman Long (Contracting) Limited, Edinburgh,  
 Scotland

Filed Feb. 4, 1972, Ser. No. 223,590

Claims priority, application Great Britain, Feb. 8, 1971,  
 4,191/71

Int. Cl. E02b 17/04; E02d 27/52

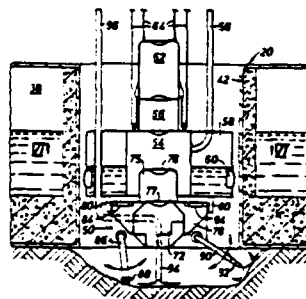
U.S. Cl. 61-46.5

10 Claims

A method of founding a structure in a subaqueous bed comprising disposing the structure on the bed and excavating beneath the structure, the excavation being effected by a wheeled positively buoyant vehicle which moves upon an undersurface of the structure and which is provided with excavating equipment.

Keywords: Dredge, suction; Dredge, submerged; Offshore construction; Seabed foundation

U.S. Cl. X.R. 37-54; 61-50



3,784,013

**MULTI-UNIT APPARATUS FOR COLLECTING OIL  
FROM THE SURFACE OF A BODY OF WATER**

William H. Daniel, 541 Putman Rd., Rogers, Ark.  
Filed Feb. 8, 1971, Ser. No. 113,555 The portion of the term of  
this patent subsequent to June 6, 1989, has been disclaimed.  
Int. Cl. E02b 15/04

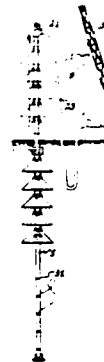
U.S. Cl. 210-242

5 Claims

Oil is collected from the surface of a body of water by immersing a tent-shaped collector from above the surface of the water to a depth such that the hydrostatic pressure of the oil in the collector will pump oil to an elevation above the surface of the water and into a collection receptacle. The collector slides vertically on a conduit and delivers the oil into the lower end of the conduit, the lower end of the conduit being positioned at a depth which determines the height to which the oil can be pumped above the surface of the water. The tent-shaped collector is in the form of a plurality of superposed coaxial cones mounted on a sleeve that slides on a hollow multiperforate stem.

Keywords: Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.21



JANUARY 15, 1974

3,785,158

**HYDRAULIC ENGINEERING INSTALLATIONS**

Andrew Noel Schofield, Didsbury, England, assignor to National Research Development Corporation, London, England  
Filed Sept. 17, 1971, Ser. No. 181,414

Claims priority, application Great Britain, Sept. 18, 1970, 44,589/70; Sept. 18, 1970, 44,590/70; Sept. 18, 1970, 44,591/70

Int. Cl. E02b 1/00, 5/02; E02d 3/10

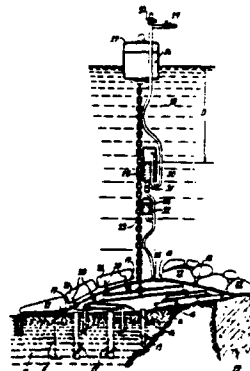
U.S. Cl. 61-1

10 Claims

A marine foundation in a pool is provided by placing a liquid impermeable sheet on the bed of the pool and locating a drain below the sheet. Then, by applying suction force to the drain, a pressure differential is set up whereby the sheet is sealed to the bed and the adjacent bed material consolidates to effectively form a solid mass embedded below and sealed to the sheet. This action affords a large capability for lateral shearing stresses. In use, anchorages, dam-form barriers, storage tanks, and other structures can be tied to the sheet.

Keywords: Fabric mat; Offshore construction; Offshore platform anchor; Offshore storage tank, emergent; Seabed foundation; Seabed soil treatment

U.S. Cl. X.R. 61-11; 61-46





3,785,159  
ATTENUATION OF WATER WAVES AND CONTROL AND  
UTILIZATION OF WAVE-INDUCED WATER  
MOVEMENTS

Douglas L. Hammond, San Carlos, Calif., assignor to FMC Corporation, San Jose, Calif.  
Continuation-in-part of Ser. No. 113,521, Feb. 8, 1971,  
abandoned. This application Nov. 21, 1972, Ser. No. 308,368  
Int. Cl. E02b 3/06, 15/04

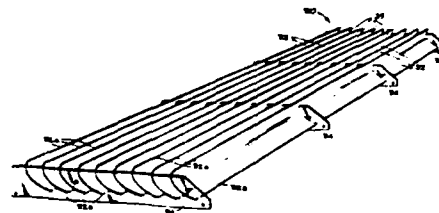
U.S. Cl. 61-5

33 Claims

Curved vane-like structures for positioning beneath or at the surface of a body of water to attenuate incident waves, and change the wave-induced normal orbital water movements to produce currents and other useful hydrodynamic effects or combinations thereof. The vanes in the structures are configured and oriented to intercept the water at various locations in its orbital movements, guide it into new paths defined by the shape of the vanes, and discharge it from the structure as a current flowing in a preselected direction, such as counter to or in the direction of wave movement, towards the water surface, or towards the bottom or floor of the body of water. These effects are utilized to perform useful work, including diminishing wave height, speed and period, moving subsurface and surface debris and contaminants such as spilled oil to a collecting point or facility, transportation and dispersal of waters polluted by thermal, chemical or other discharges, transfer of sand, silt, or other solid material on the bottom from one location to another, and generation of electrical or hydraulic power. Various styles and configurations of these vaned structures, manners in which they can be arranged to perform an intended function, and methods for securing them in operating position also are described.

Keywords: Breakwater, floating; Breakwater, steel frame; Pollutant collection; Pollutant dispersion; Pollutant, surface barrier; Power, wave

U.S. Cl. X.R. 61-1F; 61-2; 210-242



3,785,203  
WAVE FORCE TRANSDUCER  
Michael M. Mull, Van Nuys, Calif., assignor to Mechanics Research, Inc., Los Angeles, Calif.  
Filed Mar. 24, 1972, Ser. No. 237,869  
Int. Cl. G01p 5/02

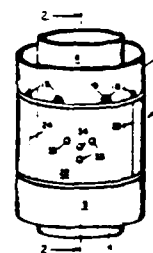
U.S. Cl. 73-170 A

3 Claims

A wave force transducer, including a shell mounted around a support column by a set of flexures which permit substantially only lateral movement of said shell and a set of hydraulic load cells spaced around said shell between said shell and support column which measure the total wave force acting upon said shell.

Keywords: Pile load measurement; Wave measurement

U.S. Cl. X.R. 73-189



3,785,496  
**OIL RECLAIMING DEVICE FOR REMOVING OIL FROM  
THE SURFACE OF WATER**

Raymond Peter Smith, Jr., South Williamsport, Pa., assignor  
to Craftmaster, Inc., Williamsport, Pa.

Filed July 28, 1972, Ser. No. 276,000

Int. Cl. E02b 1/04

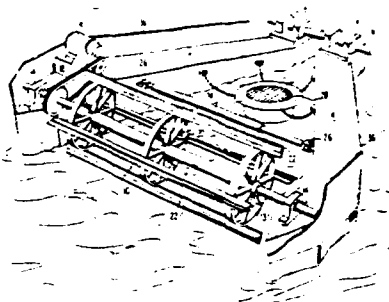
U.S. Cl. 210-242

5 Claims

An apparatus for removing oil slicks from the surface of the water which includes two independently pivotable booms connected together to form a V. A paddle wheel is connected to the two booms across the open end of the V for skimming the oil off the surface of the water and forcing the oil towards the apex of the V. A sump is located at the apex of the V for collecting the oil forced to the apex of the V by the paddle wheel. A flexible stabilizer bar is connected between the two booms for stabilizing the booms and limiting the maximum amount that the booms may pivot with respect to each other.

Keywords: Pollutant collection; Pollutant removal watercraft; Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.21



3,785,847  
**PROCESS FOR ANTI-CORROSIVE PROTECTION BY  
REDUCTION OF IONISED METALS ON METAL  
SUBSTRATE**

Leonard Wisniewski, 302 Henley Manor, Beach Road, Mowille  
Point, Cape Town, South Africa

Filed June 14, 1971, Ser. No. 152,999

Claims priority, application Brazil, June 17, 1970, 219822

Int. Cl. B44d 1/44

U.S. Cl. 117-62

8 Claims

Protecting iron and steel against corrosion by deposition of a metallic deposit from ionic compounds on the metal to be protected. The method comprises applying to the metal to be protected a paint consisting of at least one elemental metal of higher electrode potential than the metal to be protected, and at least one metal compound which yield metal ions of lower electrode potential than the metal to be protected or the elemental metal in organic binder, then treating the dry paint with acidic aqueous electrolyte containing at least one of said metal ions.

Keywords: Coating; Corrosion prevention

U.S. Cl. X.R. 106-1; 117-130R

No Figure

3,785,972  
**CONTAINING AND REMOVING OIL SPILLS  
ON WATER**

Henry E. Alquist and Armin C. Pitchford, Bartlesville,  
Okla., assignors to Phillips Petroleum Company

No Drawing. Filed Dec. 7, 1971, Ser. No. 205,739

Int. Cl. B01d 15/00; E02b 15/04

U.S. Cl. 210-40

5 Claims

A method is provided for containing oil on the surface of water and removing the oil from the water surface by increasing the liquification temperature of the oil to 50-80° F. above the temperature of the water on which it is floating by incorporating a wax into the oil to form a crust-like fused mass which will act as a boundary against extension of the oil mass and which can be easily skimmed from the water surface.

Keywords: Pollutant absorption; Pollutant, surface barrier

U.S. Cl. X.R. 210-39; 210-DIG.21

No Figure

3,786,408  
METHOD AND APPARATUS FOR OFFSHORE  
GEOPHYSICAL EXPLORATION WITH LOW POWER  
SEISMIC SOURCE

William David Jenkinson, and Paul Anthony Bryant Marke,  
both of Houston, Tex., assignors to Texaco Inc., New York,  
N.Y.

Filed Jan. 3, 1972, Ser. No. 214,880  
Int. Cl. G01v 1.00, 1'24

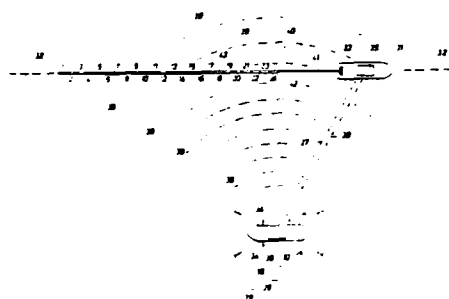
U.S. CL. 340-15.5 MC

14 Claims

This invention relates to novel methods and apparatus for making offshore geophysical surveys with a low power seismic source. A first vessel, which is provided with air guns or the like, is anchored at a predetermined location, while a second vessel tows a streamer cable along a preselected course past the first vessel. The second vessel transmits command signals to cause the air guns on the first vessel to be fired at appropriate intervals, whereby a sequence of seismic pulses is refracted along a common path on the course, and whereby each of these pulses is detected by succeeding receiver stations of the cable. All of the pulses detected at a common surface point are gathered for each of the various common surface points along the course, and are then stacked to provide a single pulse of greatly improved signal-to-noise ratio for each common surface point. The stacked signals may then be arranged to provide a refraction profile of the course, in order to define traps and the like in subterranean earth formations.

Keywords: Seismic record processor; Seismic survey method

U.S. CL. X.R. 340-7R; 340-15.5R



JANUARY 22, 1974

3,786,637  
OIL FENCE  
Tateo Muramatsu; Kuninori Aramaki, both of Yokohama, and  
Yoshikazu Kondo, Tokyo, all of Japan, assignors to  
Bridgestone Tire Company Limited, Tokyo, Japan

Filed Mar. 7, 1972, Ser. No. 232,399

Claims priority, application Japan, Mar. 13, 1971,  
46-13519

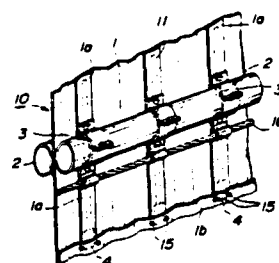
Int. Cl. E02b 15/04

U.S. CL. 61-1 F

4 Claims

An oil fence comprising an elongated resilient belt member and a float secured to it for keeping at least a part of the belt member floating above water level. The floating portion of the belt member is kept substantially upright by a weight means and reinforcing means. The oil fence so flexes as to conform with the profile of water surface.

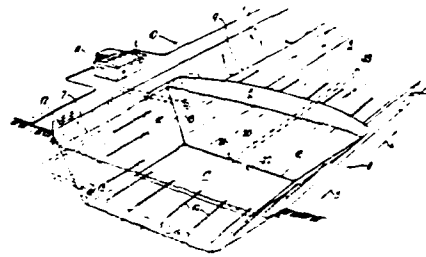
Keywords: Pollutant, surface barrier



3,786,638  
**INFLATABLE DAMS AND DAM UNITS**  
 Daniel Cecil Edward Fish, Broadthorn, Armstrong Ld.,  
 Brockenhurst, England  
 Filed June 27, 1972, Ser. No. 266,554  
 Int. Cl. E02b 7/02  
 U.S. Cl. 61-30 5 Claims

An inflatable dam unit with means to anchor it to the bed of a water course. These means are in two parts, one which primarily resists bodily movement of the unit downstream and the other which concentrates on resisting the tendency of the unit to roll. The invention also includes dams including such units when installed, and methods of damming water flow.

Keywords: Channel barrier; Tidal estuary water level; Tidal inlet



3,786,640  
**MEANS AND METHOD FOR PRODUCING STEPPED CONCRETE SLOPE STRUCTURES**  
 Lee A. Turzillo, P.O. Box 155, Bath, Ohio  
 Filed Dec. 15, 1971, Ser. No. 208,267  
 Int. Cl. E02d 17/20  
 U.S. Cl. 61-37 9 Claims

Container means, and method utilizing same for forming a mat-like protective cover of hardenable, cementitious material on a sloping surface of an earth situs, for example. Container means includes rectangular sheet-like flexible web which is spread flatwise on surface to be protected, and series of transversely extending porous fabric containers of loop-shaped cross-section which are connected to the web along laterally spaced, generally parallel lines. Fluid cementitious material pumped into containers in succession, so that adjacent containers overlap one upon another. Upon hardening, cementitious material which oozes through porous bag walls tends to bond the contacting walls together, thereby to provide an integrated mat-like protective cover of generally uniform, effective thickness.

Keywords: Concrete form; Fabric mat; Low-cost shore protection; Revetment; Sandbag; Slope protection

U.S. Cl. X.R. 61-38



3,786,642

**METHOD AND APPARATUS FOR ENTRENCHING  
SUBMERGED ELONGATE STRUCTURES**

Alan E. Good, and Delbert R. Ward, both of Houston, Tex., assignors to Brown & Root, Inc., Houston, Tex.

Filed May 16, 1972, Ser. No. 253,895  
Int. Cl. E02f 5/02; B63b 35/04

U.S. Cl. 61-72.4

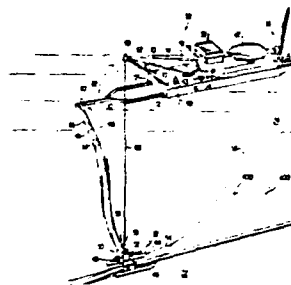
25 Claims

A method and apparatus for entrenching submerged elongate structures within the bed of a body of water including a floating vessel, and at least one submergible vehicle connected to the floating vessel and operable to be lowered adjacent to a submerged elongate structure to be entrenched. The submergible vehicle includes a frame having a fore end and an aft end with a first primary and a first alternate cutting means connected to the frame and generally operably directed toward the fore end thereof for cutting a trench within the water bed beneath the submerged elongate structure. Additionally, the submergible vehicle may be provided with a second primary and a second alternate cutting means connected to the frame and generally operably directed toward the aft end thereof for forming a trench within the water bed beneath the submerged elongate structure to be entrenched.

In one embodiment of the invention a motion compensation system is connected between the floating vessel and at least one submergible vehicle in order to minimize relative, sea induced, motion between the floating vessel and the submergible vehicle.

Keywords: Seabed pipeline placement; Seabed trencher

U.S. Cl. X.R. 37-62



3,787,144

**EXPLOSIVE PUMPING AND DREDGING METHOD AND  
APPARATUS**

Charles D. Wood, San Antonio, Tex., assignor to Southwest Research Institute, Bexar, Tex.

Filed June 29, 1972, Ser. No. 267,602  
Int. Cl. F04f 1/16; E02f 3/88

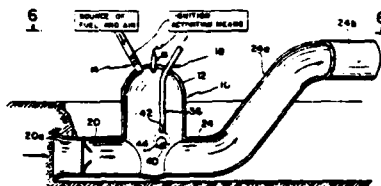
U.S. Cl. 417-74

9 Claims

A method and apparatus particularly suited for underwater dredging, trenching and the like. An explosion chamber is provided with a fuel source, a fuel ignitor and an exhaust outlet. A dredge intake conduit having a check valve communicates with the explosion chamber as does a dredge exhaust chamber. Material to be dredged enters the dredge intake and fills the explosion chamber to a certain level while fuel is admitted to the explosion chamber. The fuel is burned or exploded which closes the check valve in the dredge intake and forces the dredge material out through the exhaust conduit.

Keywords: Dredge, suction; Dredge intake; Pump; Seabed trencher

U.S. Cl. X.R. 37-58; 37-195; 417-900



3,787,802  
**AUTOMATIC RANGE SWITCHING FOR DIGITAL DEPTH  
 SOUNDERS**

Rodman S. Brahman, Berrien Springs, Mich., assignor to  
 Heath Company, Benton Harbor, Mich.

Filed May 8, 1972, Ser. No. 250,921

Int. Cl. G01s 9/68; G04f 9/00

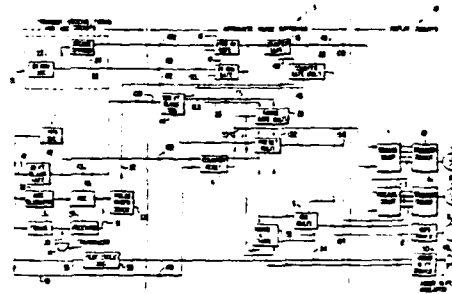
U.S. Cl. 340-3 R

5 Claims

A depth sounder instrument having automatic range switching in which an oscillator and a divider produce timing pulse trains at two different frequencies which are related to the propagation velocity of the depth sounder transmitted pulse. A selected one of the pulse trains is delivered to a digital counter during the interval between the transmitted energy pulse and the received pulse, the latter having been reflected from the bottom of the body of water. The apparatus includes logic means responsive to the count arrived at during this interval to select the total instrument range for the next interval, this range being chosen by the selection of the pulse train. If the count accumulated during the interval is appropriate to the previously selected range, no change is made. However, if the count is either much smaller than, or greater than, the counter capacity, the other frequency is chosen, thereby causing the counters to accumulate at a faster or slower rate. The frequencies are preferably related by a power of 10 and a decimal point can then be illuminated or not, depending upon the range and frequency chosen.

Keywords: Sonar, depth sounder

U.S. Cl. X.R. 324-187; 340-1R; 340-3E;  
 343-13R



3,787,803  
**HIGH PERFORMANCE METER DEPTH SOUNDER FOR  
 AUTOMATICALLY INDICATING DEPTH WITHOUT  
 MANUAL ADJUSTMENT**

John N. Beebe, Londonderry, N.H., assignor to Raytheon Com-  
 pany, Lexington, Mass.

Filed Nov. 29, 1972, Ser. No. 310,300

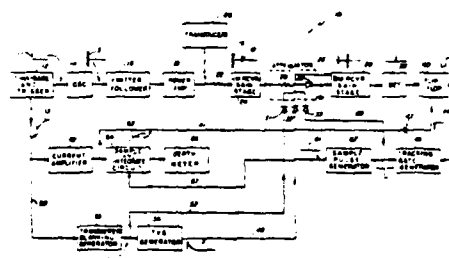
Int. Cl. G01s 9/68

U.S. Cl. 340-3 R

15 Claims

A depth meter circuit which overcomes the usual necessity for manual adjustment of the sensitivity control to improve the signal-to-noise ratio and to prevent spurious meter response to wakes and debris at intermediate depths is achieved by a dynamically adjusted receiver attenuator circuit which is controlled by the combination of an automatic bottom tracking gate, a time varied sensitivity circuit and a transmission blanking circuit operating in conjunction with a meter indicating circuit which is activated only during the time of return echoes by means of a ramp voltage sampling circuit actuated only by the return echoes. The arrangement makes possible the use of maximum transmitted power for accurate measurement of deep bottoms and on the same nonlinear scale, provides accurate readings of shallow depths without manual adjustment.

Keywords: Sonar, depth sounder



JANUARY 29, 1974

3,788,079  
METHOD AND APPARATUS FOR COLLECTING A  
FLOATING LIQUID

William P. Kirk, 22 Glenhaven Cir., Saco, and Dwight W. Reynolds, RFD 1, Box 49, Pownal, both of Maine  
Filed May 26, 1972, Ser. No. 257,413  
Int. Cl. E02b 15/04

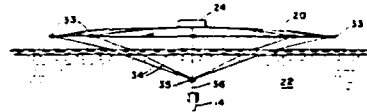
U.S. Cl. 61-1 F

13 Claims

A floating liquid such as an oil spill is collected under a sheet with weighted periphery. The sheet is deployed by spreading it horizontally over the liquid surface, after which the periphery submerge, confining and centrally concentrating the liquid. The sheet retains the liquid for subsequent pumping into a vessel.

Keywords: Pollutant collection; Pollutant, suction removal; Pollutant, surface barrier

U.S. Cl. X.R. 210-DIG.21; 210-242



3,788,082  
ASSEMBLED FENDER UNIT

Jiro Naraba, Tokyo, Japan, assignor to Seibu Gomu Kagaku Kabushiki Kaisha, Tokyo, Japan

Filed Oct. 23, 1969, Ser. No. 868,874

Claims priority, application Japan, May 8, 1969, 44-41695

Int. Cl. E02b 3/22

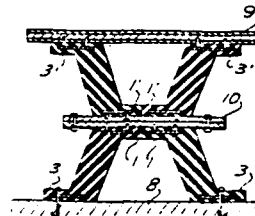
U.S. Cl. 61-48

3 Claims

The present invention relates to an assembled fender unit composed of a shock-receiver portion with a reinforcing piece embedded therein, a fixture portion with a reinforcing piece embedded therein, and an elastic intermediate section connecting the shock-receiver portion and the fixture portion with said section being inclined relative to the shock-receiver portion and the fixture portion.

Keywords: Pier fender

U.S. Cl. X.R. 114-219



3,788,085  
METHOD AND APPARATUS FOR LAYING A PIPE LINE

Robert E. Holberg, 608 W. Bough Lane, Houston, Tex.

Filed Dec. 6, 1971, Ser. No. 205,210

Int. Cl. E02f 5/02

U.S. Cl. 61-72.4

5 Claims

The present invention relates to a method and apparatus for laying a pipe line including a weighted sled having a vertical blade extending therebelow with an extruder cone affixed to its lower end for forming a subterranean tunnel for receiving a pipe. The blade is provided with a plurality of spaced jet nozzles connected to a fluid manifold for providing high pressure jet streams adjacent the leading edge of the blade to facilitate movement of the blade through earthen formations. Also, the blade is provided with a plurality of spaced inclined elevator devices for urging the soil adjacent the blade upwardly as the blade moves therethrough to relieve the soil adjacent the extruder cone and thereby facilitate formation of the tunnel passage therethrough. The method of the present invention includes treating the interior of the tunnel with a weighted low friction coefficient fluid or aqua gel to lubricate the passage to facilitate insertion of the pipe into the tunnel without damaging the coating on the pipe.

Keywords: Seabed cable plow; Seabed pipeline placement

U.S. Cl. X.R. 37-193; 172-699



3,788,258

MOORING DEVICE

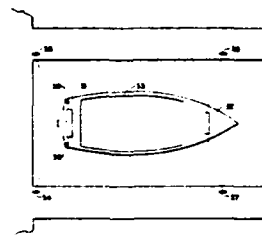
George H. Odoni, 208 Tuna, Galveston, Tex.  
Filed Nov. 15, 1971, Ser. No. 198,557  
Int. Cl. B63b 21/00

U.S. Cl. 114—230

8 Claims

A mooring device comprising a tubular member having a rod member coaxially aligned therewith and lying partially therewithin and in slidable engagement therewith, a tension producing means operatively engaged with the tubular member and the rod member such as to force the two members in opposite directions from one another, a first block and tackle system having one pulling point anchored to a first anchor bar extending from the tubular member in substantial perpendicular relation thereto and the other pulling point anchored to a first anchor bar extending from the rod member in substantial perpendicular relation thereto, a second block and tackle system having one pulling point anchored to a second anchor bar extending from the tubular member in substantial perpendicular relation thereto and the other pulling point anchored to a second anchor bar extending from the rod member in substantial perpendicular relation thereto, the two first anchor means of the first block and tackle system being disposed on substantially opposite sides of the tubular and rod members from the two second anchor means of the second block and tackle system, and mooring line extending from each of the block and tackle systems.

Keywords: Small-craft mooring device



3,788,260

SHOCK ABSORBER FOR USE AS A FENDER FOR SHIPS

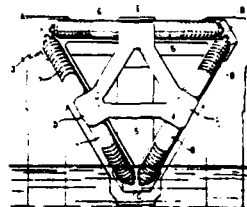
Emilio Morini, Milan, Italy, assignor to Societa' Applicazioni Gomma Antivibranti "Saga" S.p.A., Milan, Italy  
Filed Feb. 7, 1973, Ser. No. 330,347  
Int. Cl. B63b 59/02

U.S. Cl. 114—219

2 Claims

A shock absorber arrangement for use as a fender for ships and comprising a fixed plate mountable on a harbour wall and a movable plate connected thereto by an array of resilient shock absorbers of known type. The array of shock absorbers are coupled in three pairs to three points of the fixed plate, the three points lying at the apices of an equilateral triangle, and each pair of shock absorbers forms an isosceles triangle the base of which is formed by the fixed plate; the angle of the vertex of the isosceles triangle is greater than the angle of the other two apices. The three vertices of the pairs of shock absorbers are coupled to points lying at the apices of an equilateral triangle on the movable plate; the two equilateral triangles are positioned angularly displayed from one another by 60° and the two plates lie in substantially parallel planes when the arrangement is in a rest position.

Keywords: Pier fender





3,788,402  
AUTOMATICALLY SELF-REGULATING VARIABLE-  
STROKE, VARIABLE-RATE AND QUIET-OPERATING  
PILE DRIVER APPARATUS

Stephen V. Chelminski, West Redding, Conn., assignor to Bolt Associates, Inc., Norwalk, Conn.

Division of Ser. No. 102,325, Dec. 29, 1970, Pat. No. 3,714,789. This application Aug. 14, 1972, Ser. No. 280,547  
Int. Cl. E02d 1/00

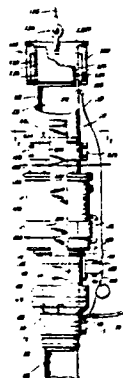
U.S. Cl. 173-91

19 Claims

Keywords: Pile driver, impact; Pile extractor

U.S. Cl. X.R. 173-127; 173-135

Automatically self-regulating variable-stroke, variable-rate and quiet-operating pile driver apparatus are disclosed in which a massive piston weight is bounced upon a cushion of pressure fluid, the pile driver advantageously being adapted for operation in four different modes. (1) only double-acting, (2) single-acting automatically converting to double-acting at maximum stroke travel, (3) only single-acting, (4) pre-stressing plus impacting plus thrusting mode, and (5) pile extraction mode. The prolonged downward push resulting from the pressurized fluid-cushioned bouncing action is more effective than the conventional sharp hammer-type blow resulting from impact of one solid mass against another. When the pile being driven encounters softer strata in the earth, in the single-acting mode, the stroke of the piston weight automatically shortens while the number of bounces per minute automatically increases, thus increasing the rate of the quiet powerful bounce thrusts for driving the pile faster, and when harder strata are encountered, the piston weight automatically bounces higher providing a longer stroke with fewer bounces per minute, thus increasing the force of each quiet powerful thrust for overcoming the increased impedance being encountered. In the double-acting mode, when harder strata are encountered, the velocity and stroke length of the piston weight increase automatically to deliver more powerful thrusts. A relatively large number of driving thrusts per minute can be provided in the double-acting mode by changing the head plug mass to shorten the maximum stroke length to increase the frequency of thrusts per minute. By virtue of the pressure fluid bouncing action imparted to the massive piston weight, the noise of metal-to-metal contact blows can be avoided, and in addition a muffler housing surrounding the ports through which the expanded pressure fluid is released muffles the sound of the flow of the fluid, such as air or steam; this muffler also serving to separate lubricating oil from the released fluid. A cylinder bottom assembly below the bounce chamber is coupled to the pile being driven to transmit the quiet powerful bounce thrusts to the pile, moving in accordance with the pile motion, and a driving fluid storage chamber and valve mechanism associated with this assembly control the flow of the pressure fluid in an automatically self-regulating manner to seek the most effective driving action from moment-to-moment as the pile encounters different strata. If desired, the bouncing action of the cushion of pressure fluid can be altered to permit the piston weight to strike bottom slightly to provide the driving mode (4) above. A self-contained lubrication system may be actuated by the pressure impulses in the bounce chamber.



3,788,481

**METHOD FOR THE ELIMINATION AND POSSIBLE RECOVERY OF THE FLOATING POLLUTING SUBSTANCES, MINERAL OILS IN PARTICULAR, FROM SHEETS OF WATER AND BOAT FITTED TO THIS AIM**  
Andrea Lucio deAngelis, via F. III Coda 37/1, Genova, Italy  
Filed June 10, 1971, Ser. No. 151,878

Claims priority, application Italy, June 11, 1970, 25830/70  
Int. Cl. E02b 15/04

U.S. Cl. 210—242

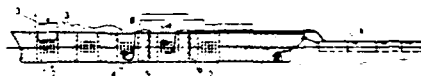
5 Claims

Method for the elimination and/or the recovery of floating polluting substances from liquid surfaces a, and boat for carrying out the method according to which:

- the polluted liquid surface is successively, fully or in part, withdrawn from the action of the wind and, at least in part, from the natural wave motion, and segregated;
- the segregated floating polluting substance is skimmed together with a minimum quantity of the underlying water;
- the liquid skimmed is collected and decanted while the floating substance is separated.

Keywords: Pollutant removal watercraft; Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.21



3,788,984

**METHOD OF REMOVING OIL SPILLS**

James Teng, St. Louis, James M. Lucas, Crestwood, and Richard E. Pyler, Shrewsbury, Mo., assignors to Anheuser-Busch, Incorporated, St. Louis, Mo.  
No Drawing. Filed Jan. 24, 1972, Ser. No. 220,385  
Int. Cl. C02b 9/02

U.S. Cl. 210—30

9 Claims

This disclosure covers a method of removing spilled oil from water surfaces without further injuring the environment, by applying a carbohydrate fatty acid ester in powder, fibrous, or granule form to the oil covered surface. The preferred ingredient is cellulose acetate. The additive is non-toxic, bio-degradable, water insoluble, and is not degraded by the acids in petroleum fuels. The additive is sprinkled on the surface of the oil coated water and after absorbing many times its weight in oil is easily removed. The picked up oil is easily removed from the cellulose acetate and up to 95% recovery of spilled oil is possible. The cellulose acetate also can be reused.

Cottonseed hulls and sawdust as the starting cellulose material are desirable because of low cost and the enhanced oil absorbing character of the resulting acetate.

Keywords: Pollutant absorption

U.S. Cl. X.R. 210-40; 210-DIG.21

No Figure

FEBRUARY 5, 1974

3,789,445

BUOY CONSTRUCTION

Larry Vane W. Frazier, Ventura, Calif., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Nov. 12, 1971, Ser. No. 198,138

Int. Cl. B63b 27/52

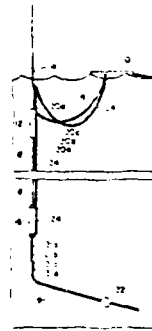
U.S. Cl. 9-8 R

2 Claims

A vertically disposed tube having valves at each end and suspended in the ocean for the purpose of creating dynamic system stability. When the valves are closed, water is trapped in the tube and forms a large mass which is added to the system. If both valves are open, water flows freely through the tube with no vertical stability added to the system.

Keywords: Buoy, instrumented

U.S. Cl. X.R. 114-125



3,789,612

METHOD OF SURF GENERATION

George E. Richard, 207 42nd St., Manhattan Beach, Calif., and Eugene D. Richard, 11570 Victory Blvd., North Hollywood, Calif.

Division of Ser. No. 56,314, July 20, 1970. This application Mar. 27, 1972, Ser. No. 238,080

Int. Cl. E02b 3/00

U.S. Cl. 61-1

7 Claims

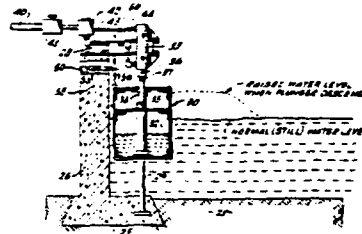
A tapered enclosure for a body of water has a wave generator positioned in a relatively narrow and deeper end. In one form, the wave generator is a buoyant plunger mounted for vertical reciprocation within a chamber having a shorewardly facing opening. Through a cyclic control system, the plunger is driven in phase with the forces of gravity and buoyancy acting thereon, starting from a rest position through strokes of increasing amplitude until a desired steady state is attained to sequentially produce waves of a desired energy. Provision is made for varying the mass of the plunger and varying the input from a prime mover as a means of adjusting wave energy and frequency.

An alternative single-wave generator comprises an open bottom water-tight enclosure having air purge valves on its upper face and connected to a prime mover for raising the tank. Upon lowering, the purge valves open, allowing air to escape from the tank while the open lower end of the tank enters the water for filling to a predetermined level. Upon the tank being pulled upwardly, with the purge valves closed, a volume of water contained within the tank is upwardly displaced, above still water level, and released when the hydrostatic equilibrium between the contained water and the outer water is upset, as when the open lower end of the tank breaks the surface of the water.

Keywords: Hydraulic model basin; Wave generator

U.S. Cl. X.R. 4-172.16; 272-26

The tapered planform and sloping floor of the enclosure provide a wave energy conserving contour, so oriented with respect to the generator as to provide a primary wave break trajectory of optimum length for the area utilized by the system. A compound floor curvature may be provided to define a wave regenerating cavity to form a secondary wave out of the energy of a previously broken primary wave. A water inlet is disposed adjacent the wave generator and an outlet or outlets are disposed adjacent a point or points of wave dissipation, along the shallow end of the enclosure, to provide a circulatory system adapted for convenient monitoring and maintaining of optimum water quality.



3,789,921

**DEVICE FOR OFF-CENTERING ABOVE-WATER  
ARTICULATED MULTIPLE-DRILLING STRUCTURES**  
Christian DeChassy, Gelos, and Andre Capdeboscq, Jurancou,  
both of France, assignors to Entreprise De Recherches Et  
D'Activites Petrolieres (ELF), Paris, France

Filed Mar. 1, 1972, Ser. No. 230,918

Claims priority, application France, Mar. 5, 1971, 7107709

Int. Cl. E02b 17/00, E21b 12/02

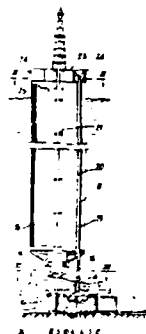
U.S. Cl. 166—5

9 Claims

A device for off-centering an above-water articulated drilling structure in relation to a base on the seabed, consisting of a roller-table on the base, surmounted by a vertical pivot-shaft, a circular roller-path, also on the base and concentric with the pivot, an off-centering carriage that can revolve round the pivot, supported by the roller-table and roller-path, and with a guide ramp along which the lower end of the main articulation of the structure can slide, and means for rotating the carriage and sliding the articulated structure along the guide-ramp

Keywords: Offshore platform anchor; Offshore platform, floating

U.S. Cl. X.R. 166-52; 175-9



3,789,988

**APPARATUS FOR REMOVING SURFACE POLLUTANTS  
FROM WATER AND OTHER LIQUIDS**

Bernard Valibouse, Grenoble, and Jacques Pichon, Saint Martin-d'Heres, both of France, assignors to Societe Grenobloise d'Etudes et d'Applications Hydrauliques (Sogreah), Grenoble (Isere), France

Continuation-in-part of Ser. No. 185,719, Oct. 1, 1971, abandoned. This application Mar. 14, 1973, Ser. No. 341,070

Claims priority, application France, Nov. 6, 1972, 7239209; Oct. 2, 1970, 7036478

Int. Cl. E02b 15/04

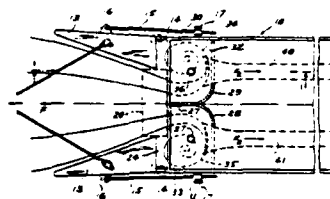
U.S. Cl. 210—242

12 Claims

The apparatus disclosed herein for removing layers of pollutants, such as oil, floating on a heavier liquid, especially water, depends for its operableness on the effect of the relative displacement speed of the heavier liquid and the overlying pollutant. Such relative speed is used to direct the removed layer of heavier liquid and pollutant, by tangential introduction, into at least one cyclone chamber wherein the induced rotation of the removed materials is caused as to create a whirlpool area in which the pollutant is concentrated. In the central portion of such concentration, the pollutant is extracted through a pipe fitting in the axis of and crossing the ceiling of the cyclone. The centrifuged water, free of pollutant, is discharged at the end of the cyclone.

Keywords: Pollutant removal watercraft; Pollutant, suction removal

U.S. Cl. X.R. 210-512



3,790,925

# ECHO-SOUNDING APPARATUS HAVING A DIGITAL INTERMEDIATE STORE

Erhard Ahrens, Kiel, Germany, assignor to Electroacoustic GmbH, Kiel, Germany

Filed June 19, 1970, Ser. No. 47,770

Claims priority, application Germany, June 26, 1969, P 19 32 346.7

Int. Cl. G01s 7/68

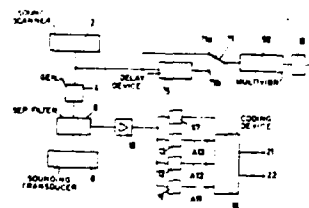
U.S. Cl. 340-3 R

6 Claims

This invention relates to echo-sounding apparatus of the kind employing at least one digital intermediate store and an indicating apparatus, and in which echo signals that arise within a sounding period and which form echo information, are read into the intermediate store and are subsequently interrogated or read out of this store and then fed to the indicating apparatus. In order to remove the defects attendant upon hitherto usual digital intermediate stores, the invention provides at least one timing pulse generator which is associated with the intermediate store and is operable at a selected frequency or, alternatively, at least two timing pulse generators are provided that operate at different pulse frequencies, in either case the intermediate store is operated on read-in of the echo information at a frequency which is different from the read-out frequency. As a result, it is possible to adjust the read-out speed independently of the read-in speed. In this way, either the whole of the echo information can be read-out slower or quicker than the speed of read-in or, alternatively, a portion of the echo information can be read-out slower or quicker than the remaining part of the echo information.

Keywords: Sonar, depth sounder

U.S. Cl. X.R. 340-3C; 343-5DP



3,790,929

# SKIP-SPREAD METHOD FOR SEISMIC SURVEYING

William Harry Mayne, and Thomas R. Crump, both of San Antonio, Tex., assignors to Petty Geophysical Engineering Company, San Antonio, Tex.

Filed Oct. 19, 1971, Ser. No. 190,478

Int. Cl. G01v 1/24

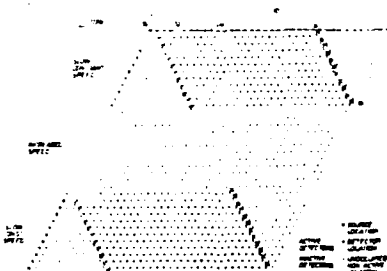
U.S. Cl. 340-15.5 MC

18 Claims

A method of seismic data acquisition wherein the average speed of data acquisition is rapid and the time and total cost necessary for data acquisition are maintained at relatively low levels. A seismic cable may be towed during an activated portion of its travel at a speed sufficiently slow to achieve optimum results of data acquisition and may be towed at a much greater speed during a deactivated portion of its travel thereby causing its average towing speed to be faster than is ordinarily practicable thereby reducing costs of data acquisition without adversely affecting the quality of the seismic data acquired.

Keywords: Seismic survey method

U.S. Cl. X.R. 340-7R; 340-15.5CP



FEBRUARY 12, 1974

3,791,150

FLOATING BREAKWATER FOR ATTENUATING SEAS

Muneoki Tachii, Mito, Japan, assignor to Debero Kogyo Co., Ltd., Mito, Japan

Filed Sept. 7, 1971, Ser. No. 178,083

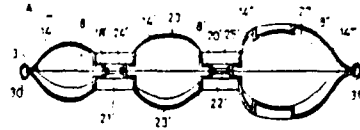
Int. Cl. E02b 3/06

U.S. Cl. 61-5

1 Claim

A floating breakwater for attenuating seas which has two or more expanding portions so disposed as for each to be increasingly enlarged in size increasingly, in turn, from the front to the rear and disposed against the propagation of sea waves

Keywords: Breakwater, floating



3,791,152

OFFSHORE STORAGE SYSTEM

William Allen Davis, Glen Ellyn, and Gerald Edward Burns, Villa Park, both of Ill., assignors to Chicago Bridge & Iron Company, Oak Brook, Ill.

Filed Feb. 16, 1972, Ser. No. 226,775

Int. Cl. E02b 17/00

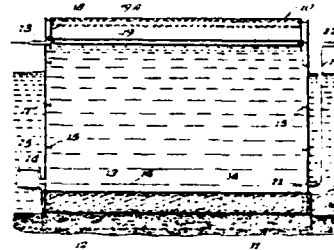
U.S. Cl. 61-46

10 Claims

An offshore storage tank having a circular cylindrical vertical shell, a continuous horizontal rigid bottom containing solid ballast joined to the shell and adapted to rest on a sea floor, said vertical shell being tall enough to project above sea level, when the bottom is on the sea floor, for a height adequate for the shell to hold, when full, a liquid to a liquid level above sea level to provide a pressure, together with the pressure of the tank weight, adequate to hold the tank in place during storm conditions at a locality where the tank is to be positioned and said vertical shell, only when supplemented by said internal liquid pressure, being able to withstand storm conditions without collapsing when the tank rests on a sea floor.

Keywords: Offshore storage tank, emergent; Seabed foundation

U.S. Cl. X.R. 220-18



3,791,153

METHOD FOR PLACING HYDRAULIC CONCRETE

Giichi Inoue, Sakai; Naoshi Kubo, Ashiya, and Shogo Hatano, Habikino, all of Japan, assignors to Naoshi Kubo, Ashiya-shi; Osaka Cement Co., Ltd. and Osaka Consulting Engineers, Ltd., both of Osaka-shi, all of Japan

Filed Feb. 15, 1972, Ser. No. 226,487

Claims priority, application Japan, Feb. 15, 1971, 46-6196; July 13, 1971, 46-51451

Int. Cl. E02d 5/40, 15/02

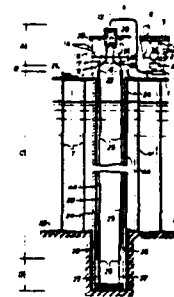
U.S. Cl. 61-46

6 Claims

A method for placing hydraulic concrete to form a concrete structure in the water which is characterized in that a paste consisting of portland cement, fine aggregate and water is transferred to the bottom of the water through elastic and watertight tubes, each of said tubes being provided with a paste delivery apparatus having a control valve, and said control valve can be controlled from the remote place above the water surface by means of hydraulic pressure, and after the placement of the predetermined amount of the paste, said tubes are wound up for a certain height and transferring of the paste is repeated again to continue the placing.

Keywords: Concrete form; Offshore construction; Seabed material placement

U.S. Cl. X.R. 61-53.52; 61-56.5; 61-63; 251-5



3,791,154

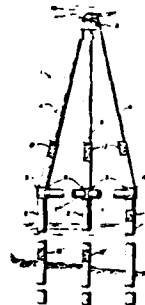
# MOORING STRUCTURE AND METHOD

Graydon H. Crain, Freedom Rd., R.D. 3, Mars, Pa.  
Continuation-in-part of Ser. No. 151,641, June 10, 1971. This  
application Mar. 2, 1973, Ser. No. 337,595  
Int. Cl. E02d 13/00, E02b 3/06, E04h 12/06  
U.S. Cl. 61-46 3 Claims

This invention relates to a mooring structure and method, comprising a triangular template or diaphragm having vertical sleeves at the corners through which tubular legs or piles are driven in telescoping arrangement. The vertical sleeves have diametrical offsets to enable their easy connection to the diaphragm. The sleeves are welded to angularly cut bottom ends of the legs. A prefabricated triangular casting is welded to the interior surfaces of the tops of the legs. Concrete is then poured through a funnel simultaneously into all the legs. One or more diaphragms may be used with each structure at a selected height above or below the water level.

Keywords: Offshore mooring structure; Pile, concrete; Pile dolphin; Pile section connection; Pile, steel

U.S. Cl. X.R. 52-654; 52-655; 61-48



3,791,156

# METHOD AND APPARATUS FOR DETERMINING THE POSITION OF A PIPELINE OR THE LIKE DURING THE ENTRENCHING THEREOF

Antonie C. Van Zutphen, Bergschenhoek, Netherlands, assignor to N.V. Industriele Handelscombinatie Holland, Rotterdam, Netherlands

Filed Sept. 13, 1971, Ser. No. 179,793

Claims priority, application Netherlands, Sept. 14, 1970, 7013562

Int. Cl. E02f 5/02; B21c 51/00

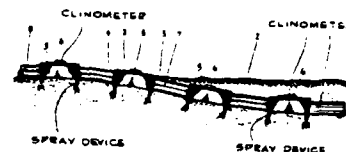
U.S. Cl. 61-72.4

4 Claims

Pipelines are entrenched on a marine floor by dragging therealong a plurality of spray nozzles that dig a trench for the pipeline. Undesirably sharp local curvature of the pipeline is avoided by providing each spray device with a clinometer the clinometer readings being transmitted to a point above the surface of the water and the composite of these received clinometer readings permitting control of the trenching process so as to avoid that undesirable curvature.

Keywords: Seabed pipeline placement; Seabed trencher

U.S. Cl. X.R. 33-84; 72-32



3,791,480

# STRESS RELIEF INSERT FOR FLEXIBLE TOWED ARRAY

Walter L. Clearwaters, Quaker Hill, Conn., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Oct. 13, 1972, Ser. No. 297,579

Int. Cl. G01v 1/16

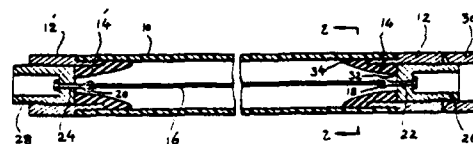
U.S. Cl. 181-.5 A

5 Claims

A stress relief insert of a generally cylindrical shape having a small inner diameter at one end and tapering out to a larger inner diameter at the other end. The insert is made of a flexible material and is positioned between one end of a flexible boot and a rigid end piece in a flexible towed array. The end having the smallest inner diameter is in contact with the rigid end piece of the towed array and the other end of the insert is in contact with the flexible boot over a length of the inner wall of the boot.

Keywords: Towing cable

U.S. Cl. X.R. 138-109; 138-118; 340-7R



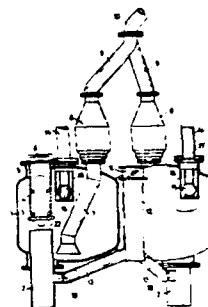
3,791,763  
**PUMP USED IN DREDGING SYSTEMS OPERATING  
 WITH COMPRESSED AIR**  
 Giovanni Faldi, Via Forese Donati, 27, Firenze, Italy  
 Filed Feb. 22, 1972, Ser. No. 228,006  
 Claims priority, application Italy, Mar. 16, 1971, 21851  
 A/71

Int. Cl. F04f 1/06, E02f 3/88  
 U.S. Cl. 417-118 3 Claims

An improvement in the pumps, used in the dredging systems and operating with compressed air, is disclosed, wherein foreign materials, tending to interfere with the operation of the inlet valve and at times to clog the supply pipe of the compressed air, are prevented from entering into the said pipes, by means of an inlet pipe for the dredged material the discharge opening of which is not flushed with the bottom of the pump casing and the closure member for the said discharge opening is positioned outside of the inlet pipe and is axially displaced with respect to the inlet pipe and above the same.

Keywords: Dredge, suction; Dredge intake; Pump

U.S. Cl. X.R. 37-58; 417-503



3,791,990  
**OIL ABSORBENT**  
 Karl Otto Paul Fischer, Chilliwack, British Columbia, Canada, assignor to Fischer Holdings Ltd., Chilliwack, British Columbia, Canada  
 No Drawing. Filed Jan. 3, 1972, Ser. No. 215,165  
 Int. Cl. B01f 1/22 6 Claims

An oil absorbent material, specifically peat, having a moisture content of less than ten percent by weight for use particularly in removing oil film from water.

Keywords: Pollutant absorption

U.S. Cl. X.R. 210-40

No Figure

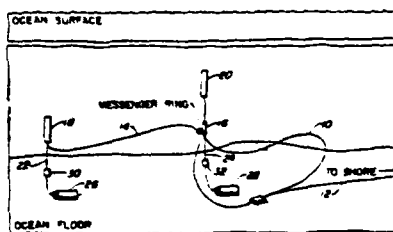
3,792,421  
**UNDERWATER DATA TRANSMISSION SYSTEM**  
 Larry Vane W. Frazier, Ventura, Calif., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.  
 Filed July 12, 1972, Ser. No. 270,878  
 Int. Cl. B63b 21/00 1 Claim

U.S. Cl. 340-4 R

The present invention is a method for raising and lowering an umbilical cable into which other cables could be plugged, the cable being retrieved by releasing a connector through a signal sent on the cable. This allows the messenger cable to float to the surface, and after servicing the cable is equipped again with a releasable weight and allowed to fall to the ocean floor.

Keywords: Instrument cable; Instrument retrieval

U.S. Cl. X.R. 9-8R; 114-206R





3,792,425

**DEVICES FOR GENERATING ACOUSTIC WAVES IN A LIQUID MEDIUM**

Pierre Magneville, Vernouillet, and Claude Duconge, Le Vesinet, both of France, assignors to Institut Francais Du Petrole

Filed Oct. 13, 1971, Ser. No. 188,816

Claims priority, application France, Oct. 15, 1970, 7037350

Int. Cl. H04b 13/00

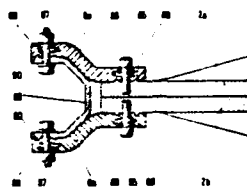
U.S. Cl. 340-12 R

9 Claims

Device for generating acoustic waves in a liquid medium by implosion having two movable rigid members interconnected by a deformable membrane the membrane is formed of two annular strips each perpendicularly secured to the external edge of a movable member and to an annular flange external to the moveable members respectively to form a tight enclosure between the moveable member. At least one annular boss is provided on the external edges of the rigid members and on the annular flange to achieve a proper sealing between the external liquid medium and the enclosure.

Keywords: Seismic implosive acoustic transmitter

U.S. Cl. X.R. 181-.5H; 340-8R



FEBRUARY 19, 1974

3,792,538

**ARTIFICIAL ISLAND FORMED OF HINGEDLY INTERCONNECTED PONTOONS**

Robert De Groot, Westkinderdijk, Netherlands, assignor to N. V. Industriële Handelscombinatie, Netherlands

Filed Jan. 17, 1972, Ser. No. 218,206

Claims priority, application Netherlands, Jan. 18, 1971, 7100649

Int. Cl. E02f 3/88, E02b 17/00

U.S. Cl. 37-67

9 Claims

An artificial island in the form of a mobile offshore platform comprises a pontoon and at least three columns that are movable vertically relative to the pontoon to support the pontoon in lowered position or to float with the pontoon in raised position. The pontoon is sectional and the sections are pivotally interconnected for horizontal swinging movement relative to each other so that the sections can occupy different positions relative to each other when the platform is being transported and when the platform is emptied. Each section carries at least one of the columns. A suction dredge is carried by the pivot between two adjacent sections.

Keywords: Dredge, cutterhead; Offshore platform, jack up; Offshore platform, walking

U.S. Cl. X.R. 37-72; 37-73; 61-46.5; 114-77; 114-235R



3,792,589

**FLOATING BARRIER**

James A. Sayles, Kensington, Calif., assignor to Chevron Research Company, San Francisco, Calif.

Filed Jan. 17, 1972, Ser. No. 218,253

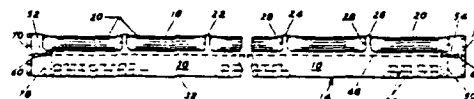
Int. Cl. E02b 15/04

U.S. Cl. 61-1 F

10 Claims

A boom for collecting material floating on the surface of a body of water which can be deployed and recovered expeditiously and without damage to the structure of the boom, and which is made to be stored in a compact condition either as flat layers of folded material or by rolling it on a roller. The boom is constructed to have a continuously smooth outer surface without projections or fixtures or metal parts appearing on its outer surface throughout substantially its entire length, both to eliminate the hazard of such parts being snagged or caught on sharp edges of wharfs or portions of a ship while the boom is being played out or retrieved thereby reducing the possibility of the fabric of the boom being torn and damaged, and also to prevent injury to the men handling the boom by suffering cuts, bruises and wounds from such projecting elements. Particular attention is given to means for distributing stresses imposed on the boom in use to prevent damaging concentration of stress on any part of the fabric from which it is in part made. The boom is made with inflatable flotation chambers from which the air is released when the boom is retrieved and stored and all of the elements of the combination that make up the boom such as the stress cables, stress plates and ballast weights are placed between and within the impervious sides of the boom so that when the air chambers are collapsed the boom has a thickness throughout its total area which is not substantially greater than the thickness of the folded impregnated fabric of which it is made.

Keywords: Pollutant, surface barrier



3,793,218

**OIL SLICK DISPERSANT AND METHOD**

Gerard P. Canevari, Cranford, N.J., assignor to Esso Research and Engineering Company

No Drawing. Filed June 15, 1971, Ser. No. 153,430

Int. Cl. B01f 17/00; B01f 13/00

U.S. Cl. 252-312

11 Claims

Mixtures of  $C_{10}$ - $C_{20}$  aliphatic carboxylic acids or the sorbitan monoesters thereof, sorbitan monoacylates, polyoxyalkylene adducts of the sorbitan monoesters and dialkyl sulfosuccinate salts having a hydrophilic-lipophilic balance of about 9 to about 11.5, preferably about 10 to 11, are highly efficient, nontoxic biodegradable dispersants for oil slicks. Oil slick dispersal is achieved by supplying the dispersant composition to the oil slick either alone or admixed with a suitable solvent. An advantage of these dispersant compositions is that they require little or no mixing energy in order to achieve dispersion of the slicks.

Keywords: Pollutant dispersion

U.S. Cl. X.R. 252-8.55; 252-354; 252-356

No Figure

FEBRUARY 26, 1974

3,793,840

**MOBILE, ARCTIC DRILLING AND PRODUCTION  
PLATFORM**

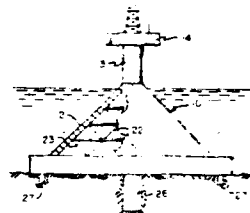
George E. Mott, Metairie, and James P. Wilbourn, New Orleans, both of La., assignors to Texaco Inc., New York, N.Y.  
Filed Oct. 18, 1971, Ser. No. 189,972  
Int. Cl. E02b 17/00

Keywords: Ice protection; Offshore caisson;  
Offshore platform, jack up; Seabed  
foundation

U.S. Cl. 61—46.5

5 Claims

The invention relates to a marine platform adapted to be removably positioned at an offshore node of water, the surface of which is periodically subjected to sheet ice and floating ice masses. The platform includes a controllably buoyant foundation-like base at its lower end, which normally rests on the ocean floor. A shell-like body extends upwardly from said base and is defined on its external surface by a progressively decreasing cross sectional area from the body lower end, to a point adjacent the upper end. A work deck disposed at, and operably carried at the body upper end includes equipment necessary to function at said off-shore site. A caisson extending uprightly through the platform is partially embedded into the substratum beneath the platform, firmly anchoring the latter and protecting wells during and after a drilling operation.



3,793,842

**SELF-STABILIZING SUBMARINE TANK**

Roger Lacroix, Sceaux, France, assignor to Sea Tank Co., Paris, France

Filed Mar. 6, 1972, Ser. No. 231,933

Claims priority, application France, Mar. 5, 1971, 71.07723

Int. Cl. B65g 5/00; E02d 27/38

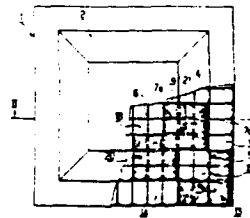
Keywords: Offshore storage tank, submerged;  
Seabed foundation

U.S. Cl. X.R. 61—50

U.S. Cl. 61—46.5

5 Claims

A submarine tank formed of pre-stressed concrete comprises central cells and outward peripheral ballast cells. The cells are interconnected and can be filled with liquid hydrocarbons. Appropriate control means can be provided for effectuating the controlled submerging of the tank. Vertical pillars can be provided to remove any vertical force effect of swells. Lower stud members can be provided on the bottom of the tank.



3,793,843

# FLOATING BREASTING PLATFORM

Arick S. Malkiel, 94-09 68th Ave., Forest Hills, N.Y. 11375

Filed Sept. 14, 1972, Ser. No. 289,116

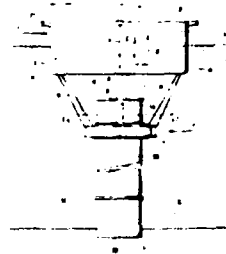
Int. Cl. E02b 3/22, B63b 21/00

U.S. Cl. 61-46

12 Claims

A vessel-like floating platform adapted for the breasting and berthing of transport vessels in a body of water at an offshore location and capable of resisting wave and impact forces and of adjusting to variations in water level, comprises a platform anchored or moored by a universal coupling to a vertical shaft embedded in the land surface underlying the body of water. The universal coupling comprises a downwardly extending outrigger structure which engages by means of a universal connection the surface of an annular member slidably mounted on the upper portion of the shaft, thereby enabling vertical, rotational, and angular movement of the platform and capability of adjusting to a position relative to prevailing wind, wave, and current forces for optimum in breasting the approaching vessels.

Keywords: Offshore mooring structure; Offshore platform anchor; Offshore platform, floating



3,793,845

# APPARATUS AND METHOD FOR ANCHORING SUBMERGED CONDUIT

James M. Keith, Sunnyvale, Calif., assignor to Marcona Corporation, San Francisco, Calif.

Filed July 20, 1972, Ser. No. 273,447

Int. Cl. E02d 15/06

U.S. Cl. 61-72.1

12 Claims

Elongate flexible envelope draped over submerged conduit defining elongate lobes along side the same which when partially filled with non-soluble particulate matter such as sand serves to anchor the conduit.

Keywords: Fabric mat; Seabed material placement; Seabed pipeline placement; Seabed scour protection

U.S. Cl. X.R. 61-46; 61-72.2; 61-72.3; 114-206



3,794,175

# OIL RECOVERY APPARATUS

Joe K. Stewart, 22818-102nd Pl. West, Edmonds, Wash. 98020

Filed May 15, 1972, Ser. No. 253,433

Int. Cl. E02b 15/04

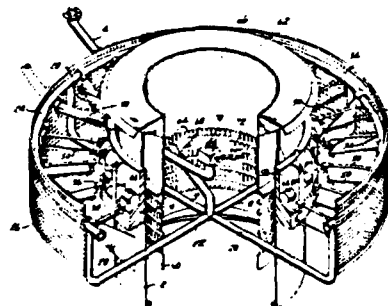
U.S. Cl. 210-242

18 Claims

Floating oil is picked up by water jets and carried over a vertical wall into a receiving chamber. The water jet forming nozzles and the receiving chamber are parts of a floating vessel. The water jet forming nozzles are positioned to discharge upwardly through the floating oil. Float controlled mechanisms automatically maintain the jet nozzles properly oriented with respect to the receiving chamber wall.

Keywords: Pollutant removal watercraft; Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.21



3,794,965

# MARINE SEISMIC CABLE BUOYANCY SYSTEM

Charles J. Charske, Houston, Tex., assignor to Esso Production Research Company, Houston, Tex.

Filed Sept. 18, 1972, Ser. No. 289,928

Int. Cl. B63b 21/56; H01b 7/12; G01v 1/16

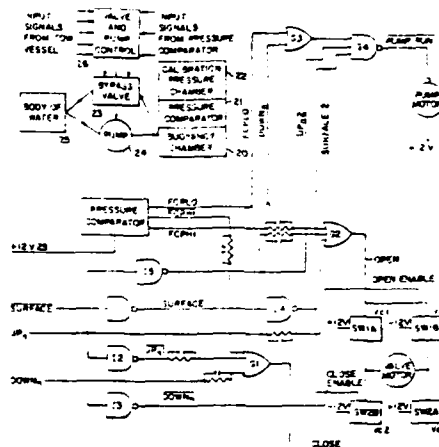
U.S. Cl. 340-7 PC

20 Claims

The buoyancy of a marine seismic cable is controlled by transferring water into and out of individual buoyancy units located between sections of the cable. Each buoyancy unit includes a chamber containing a confined gas maintained at a pressure greater than ambient water pressure, a pump for introducing water into the chamber, and means for expelling water as necessary. A control system which permits both manual and automatic adjustments of the cable buoyancy is provided. This makes possible the towing of the cable at essentially constant depths behind an initial cable section fitted with a depth controller.

Keywords: Seismic streamer cable; Towed body depth control

U.S. Cl. X.R. 114-235B; 114-16E



MARCH 5, 1974

3,795,315

# CONTROL OF WATERBORNE OIL SLICKS

Paul Preus, Smith Rd., Toms River, N.J. 08753

Filed Jan. 2, 1970, Ser. No. 214

Int. Cl. E02b 15/04

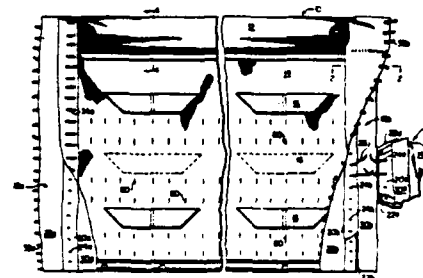
U.S. Cl. 210-242

1 Claim

An apparatus and process for controlling waterborne oil slicks wherein a floating barrier having a fluid pervious skirt is positioned in a controlling position relating to the slick and an oleophilic-hydrophobic fibrous substance is introduced into the slick to absorb the oil and render it impenetrable of the skirt.

Keywords: Pollutant absorption; Pollutant collection; Pollutant, surface barrier

U.S. Cl. X.R. 210-DIG.21



3,795,759

# BUOYANT ELECTRICAL CABLE

William A. Rhyne, Panama City, Fla., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Oct. 5, 1970, Ser. No. 78,606

Int. Cl. H01b 7/12

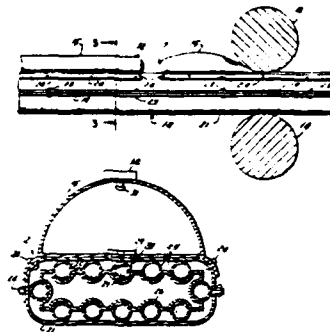
U.S. Cl. 174-101.5

8 Claims

An improved electrical conductor of the buoyant type is herein disclosed. An electrical conductor, or a plurality thereof, is supported in a flat casing co-extensive therewith by a shaped loom. A plurality of inflatable buoyancy devices are supported along one surface of said casing to support said casing on the surface of a body of water. Means are disclosed for inflation of said buoyant means individually as well as collectively.

Keywords: Instrument cable

U.S. Cl. X.R. 340-7PC; 114-235B



MARCH 12, 1974

3,796,056

# H-PILE COMBINATION WITH PROJECTING PLATE MEANS

John J. Dougherty, Cedar Grove, N.J., assignor to APF Corporation, Clifton, N.J.

Filed Apr. 18, 1972, Ser. No. 245,248

Int. Cl. E02d 5/22

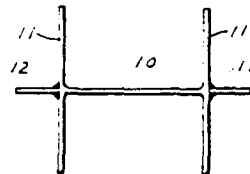
U.S. Cl. 61-53

4 Claims

An H-pile is disclosed having plate means welded to surfaces of the pile providing outwardly projecting plates for increasing the surface in contact with the soil thereby increasing the resistance offered by the pile to upward pressures. In addition the pile is stiffened thereby and driving of the pile is more stable with less likelihood of the pile deviating from a vertical position or being bent in driving. The outwardly extending plates may be provided by various structural forms.

Keywords: Pile, steel

U.S. Cl. X.R. 61-52



3,796,057

**PILE SPLICER WITH RETAINING MEANS**

John J. Dougherty, Cedar Grove, N.J., assignor to APF Corporation, Clifton, N.J.

Filed May 15, 1972, Ser. No. 253,229

Int. Cl. F16I 21/00, 27/10; E02d 5/22

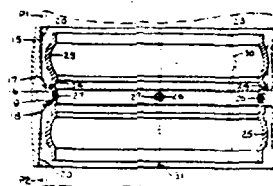
U.S. Cl. 61-53

16 Claims

A pile splicer or coupling is disclosed by which the ends of two piles are spliced together for further driving into the earth and to align the ends of two piles. A double ended splicer includes an outer sleeve having an inwardly directed ledge between its ends. An inner retaining means for the end of each pile is carried by or secured to the ledge and is spaced from the outer sleeve so as to receive the end of the pile therebetween. The end of each pile engages opposite shoulders of the ledge. Each retaining means has a bulge extending outwardly therefrom and located between the ledge and the end of this means to frictionally engage the inner surface of the pile and more securely retain the end of the pile within the splicer. The inner surface of the outer sleeve tapers inwardly so as to freely guide the pile into the splicer. This taper also preferably is a little smaller at the inner end of the taper than the diameter of the pile so that the end of the pile is compressed to add its grip to the splicer as well as to contract the end of the pile somewhat. The retaining means may be a sleeve which also may be slotted for greater flexibility. A single ended splicer to frictionally receive the end of one pile has a shorter outer sleeve and a single inner retaining means.

Keywords: Pile section connection; Pile, steel

U.S. Cl. X.R. 52-728; 285-331; 285-371; 285-398; 285-417; 287-108



3,796,656

**OIL SLICK REMOVAL METHOD, SYSTEM AND BAG THEREFOR**

Reginald L. Avey, 39 Sunny Acres,

Baie d'Urfe, Quebec, Canada

Filed Dec. 29, 1971, Ser. No. 213,668

Int. Cl. B01d 37/00; E02b 15/04

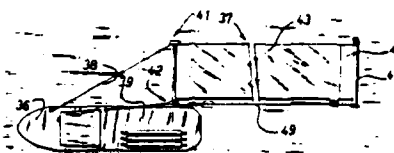
U.S. Cl. 210-65

9 Claims

A method for removing an oil slick or other flotsam which consists in dragging the open mouth of an initially empty collecting bag in partly immersed position along the surface of a body of water which is covered for instance by an oil slick, to cause the latter to enter into the bag, and to weight and release the open mouth of the bag to allow the same to sink and become suspended from the remainder of the bag. A system adapted to be attached to one or two boats to so drag the mouth of the bag and having releasing and supporting elements adapted to release and allow sinking the mouth of the bag. An oil collecting bag adapted to float while holding collected oil and having a skin constructed of either open mesh material, fabric or film plastic such as to collect oil, with or without being water pervious.

Keywords: Pollutant collection; Pollutant, mechanical removal

U.S. Cl. X.R. 210-242; 210-DIG.21



MARCH 19, 1974

3,797,139

**FLOATING DREDGE MOTION COMPENSATOR**

Edward Larralde, Santa Barbara, Calif., assignor to Vetco Offshore Industries, Inc., Ventura, Calif.

Filed Aug. 24, 1972, Ser. No. 283,473

Int. Cl. E02f 3/90

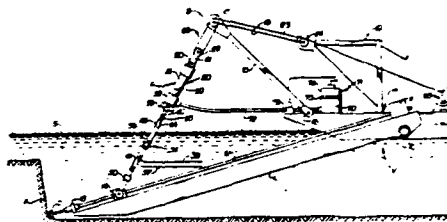
U.S. Cl. 37-67

16 Claims

Apparatus automatically compensating for relative vertical movement between a dredging vessel and its cutter, or other formation removing mechanism, to maintain a predetermined vertical position of the cutter mechanism despite vertical motion of the floating dredge vessel caused by sea conditions. The compensating apparatus includes a cylinder and piston device containing a hydraulic fluid under pressure exerting a preselected lifting force on the cutter mechanism and automatically extensible and contractable to permit the vessel to move without effecting movement of the cutter mechanism and the force that such mechanism exerts on the formation.

Keywords: Dredge, cutterhead; Dredge ladder control

U.S. Cl. X.R. 37-72



3,797,255

**UNDER-WATER ANCHOR APPARATUS AND METHODS OF INSTALLATION**

Archer W. Kammerer, Jr., Fullerton, Calif., and Gary R. Johnson, Houston, Tex., assignors to Baker Oil Tools, Inc., Commerce, Calif.

Continuation of Ser. No. 132,993, April 12, 1971, abandoned, which is a continuation-in-part of Ser. No. 23,700, March 30, 1970, abandoned. This application Feb. 26, 1973, Ser. No. 335,648

Int. Cl. E02d 5/54

U.S. Cl. 61-46

35 Claims

An anchor forms part of a drill pipe string secured to a drill bit that drills the hole from the ocean sea bottom or floor to the required depth at which the anchor is to be set. Anchor members or flukes are expanded outwardly to set or secure the anchor to the formation, or the anchor is otherwise secured to the formation, after which an anchor cable or chain is lowered through the drill pipe or lowered over the drill pipe and coupled to the set anchor, whereupon the drill pipe is released from the anchor apparatus and retrieved, with the cable or chain extending to the surface of the ocean or other body of water.

Keywords: Embedment anchor

U.S. Cl. X.R. 61-53.68





3,797,256

**JACK-UP TYPE OFFSHORE PLATFORM APPARATUS**  
Robert P. Giblon, Shrewsbury, N.J., assignor to George C. Sharp, Inc., New York, N.Y.

Filed Sept. 8, 1972, Ser. No. 287,256

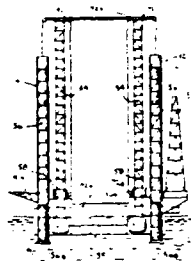
Int. Cl. E02b 17/00; B63b 35/44

U.S. Cl. 61-46.5

30 Claims

Floatable, jack-up type offshore drilling platform apparatus has "multiple-stage" feature permitting use in water depths greater than 300 feet, e.g., 600 feet or more, under 100-year storm conditions. Either a mobile type rig or a self-erecting permanent type platform structure is provided. Apparatus includes a floatable upper or working platform to be jacked out of water, one or more lower support platforms each functioning as a weight support and as a lateral bracing structure when the apparatus is erected, a plurality (three or more) of 300 feet long upper support legs permanently attached at their lower ends to each lower platform and whose upper ends are slidable through, but attachable to the next platform thereabove, and a plurality of independently movable lower support legs whose upper ends are slidable through, but attachable to the lowermost platform and whose lower ends rest on the sea bottom. Lower stages widen progressively for increased stability. Stages telescope, the lower platforms nesting with the upper platform, and all support legs projecting above water level, when rig is collapsed and floating. Buoyancy tanks on lowermost legs permit use of winch and cable devices or low-powered jacks for raising and lowering same, and buoyancy tanks in each lower platform permit use of low-powered jacks for raising and lowering platforms, including upper platforms. Telescopic air or compressed gas operated jack, 145 feet long and having expansible movement of 105 feet, is attached at lower end of each lower support leg in one embodiment, and is also useful on modified form of jack-up offshore platform for intermediate depths.

Keywords: Offshore platform, jack up; Offshore platform, leg; Pile placement; Seabed foundation



3,797,258

**SHIM TAKE-UP RING FOR PILE CONNECTION**

Sidney E. Dubuisson, P.O. Box 60252, New Orleans, La., and Allen J. Verret, P.O. Box 1219, Morgan City, La.

Filed July 12, 1972, Ser. No. 270,893

Int. Cl. B63b 21/00; F16I 9/18; E21b 19/10

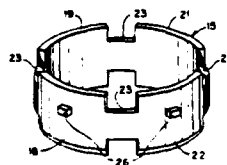
U.S. Cl. 61-53.5

6 Claims

The invention relates to a shim fixture adapted for use on a structure employing an elongated cylindrical leg which accommodates an internal cylindrical anchoring pile. The leg slidably accommodates the pile through the center passage thereof as the pile is embedded into an anchoring substratum to a desired depth. The non-uniform annular opening defined between contiguous walls of the pile and the leg respectively is provided with a shim type take-up ring. The latter is fabricated from a series of discrete, circularly arranged shim segments, each segment having a desired thickness adapted to best be urged through a portion of the irregularly spaced annular opening.

Keywords: Offshore platform, leg; Pile, structure connection

U.S. Cl. X.R. 61-46.5; 138-112; 285-138; 285-421



3,797,260

# PIPELINE ANCHORING SYSTEM

Brian C. Webb, 732 South 95 East Ave., Tulsa, Okla.,

Filed May 18, 1972, Ser. No. 254,461

Int. Cl. F16L 1/00, E02d 5/74

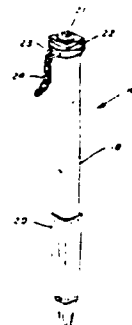
U.S. Cl. 61-72.1

13 Claims

This invention describes a method and apparatus for anchoring a mechanical pipeline system by attaching it to a plurality of anchor posts which have been positioned in the earth. The anchor posts are provided with means for attaching two tension members to their top end. The pipeline may be anchored in a ditch dug into the earth, or in the earth under an overlying layer of water. A plurality of anchor posts arranged in spaced relation along a line are positioned in the earth. The pipeline is placed on the line over the tops of the anchor posts. A clamp means, adapted to be bent around the pipe, is placed over and around the pipe. The two tension members which are attached to the posts are then locked to the clamp. Thereafter the pipe is locked to the anchor posts by means of the clamps and the tension members.

Keywords: Embedment anchor; Seabed pipeline placement

U.S. Cl. X.R. 61-53.58; 52-155; 52-161; 248-49; 138-105



MARCH 26, 1974

3,798,867

# STRUCTURAL METHOD AND APPARATUS

Benjamin F. Starling, 1907 Bahia Mar Dr., Stone Mountain, Ga.

Filed Mar. 2, 1972, Ser. No. 231,262

Int. Cl. E04c 3/34

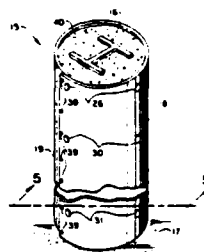
U.S. Cl. 52-724

14 Claims

Method and apparatus for increasing the strength of a structural member and for repairing and reinforcing installed structural members in situ. The structural member is enclosed with a rigid cover and the space between the cover and the structural member is completely filled with a suitable epoxy or other material which bonds both to the structural member and to the cover. The bonding material, which is preferably heavier than water, occupies cracks and other damaged regions existing in the structural member and also displaces water from the space between the cover and the structural member, so that installed structural pilings or the like in marine environments can be repaired and reinforced according to the present invention. In another disclosed embodiment of the invention, the space between a structural member and a surrounding spaced-apart enclosure is filled with a suitable substance such as concrete. The concrete or other filler is mechanically anchored both to the enclosure and to the structural member to provide a unitary structural support having greatly increased strength compared to the original structural member.

Keywords: Concrete form; Pile, steel; Structure repair

U.S. Cl. X.R. 52-729; 52-743



3,798,911

# FLOATABLE BOOM STRUCTURE

Per Olog Oberg, Sollentuna, Sweden, assignor to Sanera Projecting Aktiebolag, Bromma, Sweden

Filed Mar. 31, 1971, Ser. No. 129,932

Claims priority, application Sweden, Apr. 2, 1970, 4568/70; Aug. 4, 1970, 10704/70; Jan. 27, 1971, 979/71

Int. Cl. E02b 15/04

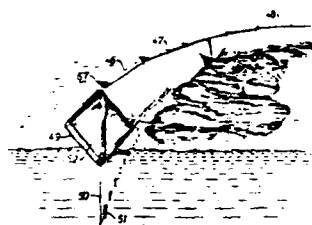
U.S. Cl. 61-1 F

11 Claims

A floatable boom structure and a method of manufacturing same. The boom structure includes a plurality of elongated sections which can be interconnected to permit formation of a boom structure of selected length. Each boom section includes an elongated bouyant member provided with internal partitions for dividing same into a plurality of isolated bouyant compartments. The bouyant member, and the compartments contained therein, can be filled with air to provide the boom with the desired bouyancy. A weighted curtain is secured to the bouyant member for suspension into the water. The bouyant member can be collapsed to permit compact storage of the boom sections. Resilient expander devices are disposed within the bouyant member for permitting expansion or collapsing of same.

Keywords: Pollutant, surface barrier

U.S. Cl. X.R. 61-5



3,798,912

# ARTIFICIAL ISLANDS AND METHOD OF CONTROLLING ICE MOVEMENT IN NATURAL OR MAN-MADE BODIES OF WATER

John S. Best, 4121 Oaks Ct., Midland, Mich., and Hubert Stacy Smith, 12 Center Ave., Eastville, Mich.

Filed July 3, 1972, Ser. No. 268,467

Int. Cl. E02b 3/00

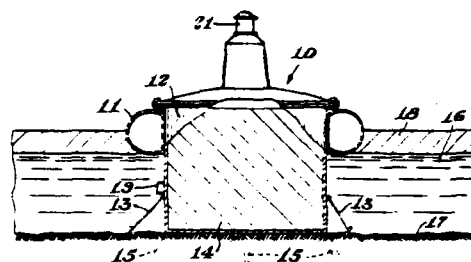
U.S. Cl. 61-1 R

14 Claims

Mobile, nonpermanent, artificial islands and a method of utilizing the same to control the movement of natural ice formations in or near natural and man-made bodies of water such as lakes, rivers, sounds, straits, bays, shipping channels, harbors and the like. The artificial islands are formed from structures having body cavities which are substantially filled with a liquid composition which freezes to form an ice-like solid at a temperature higher than the freezing temperature of the body of water in which they are positioned, thus rigidizing and firmly securing the structures to the bed of the body of water prior to the formation of natural ice in the body of water. During warm seasons the liquid composition melts allowing the artificial islands to be easily transferred to new positions, thus optimizing control of ice movement in any specific body of water at minimum cost.

Keywords: Ice protection; Offshore island; Offshore structure fender; Seabed foundation; Ice structure

U.S. Cl. X.R. 61-46; 62-260



3,798,916

# ARTICULATED ENERGY ABSORBING MARINE FENDER ASSEMBLY

Leonard J. Schwemmer, Erie, Pa., assignor to Lord Corporation, Erie, Pa.

Filed Nov. 15, 1971, Ser. No. 198,889  
Int. Cl. E02b 3/22

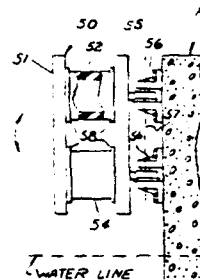
U.S. Cl. 61-48

23 Claims

A marine structure such as a pier, vessel or the like is protected from a mooring marine vessel by a marine fender assembly. The marine fender assembly preferably includes a fender spaced from and extending horizontally along the structure and resilient mounting means, preferably a plurality of discrete elastomeric buckling columns, spaced along and extending between the fender and structure for absorbing the impact energy of the mooring marine vessel. To improve the efficiency of the resilient mounting means and reduce force levels during impact, articulating means is disposed between the fender and structure in series with the resilient mounting means and operatively interconnects the fender and structure for allowing the fender to be articulated without significant deflection of said mounting means relative to the marine structure.

Keywords: Pier fender

U.S. Cl. X.R. 114-219; 267-140



3,799,093

# FLOATING PRESTRESSED CONCRETE WHARF

Wade D. Thomson, P.O. Box 3288, Jackson, Tenn.

Filed May 7, 1973, Ser. No. 357,909

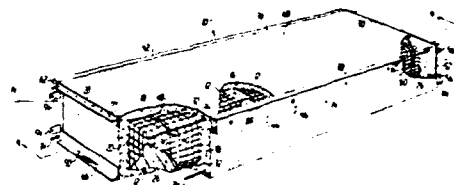
Int. Cl. B63b 35/00

U.S. Cl. 114-5 F

7 Claims

A floating prestressed concrete wharf and a method of manufacturing the same are disclosed. The wharf includes pretensioned strands in critical disposition, may include transverse pretensioned cables in its uppermost slab, has wire reinforcing mesh in the concrete and a core of buoyant material.

Keywords: Pier, floating



3,800,219

# METHOD AND APPARATUS FOR DETECTING OIL POLLUTION IN WATER

Theodore M. Fosberg, 1913 S.W. 167th, Seattle, Wash.

Continuation of Ser. No. 94,899, Dec. 3, 1970, abandoned.

This application Oct. 10, 1972, Ser. No. 296,335

Int. Cl. G01r 27/02

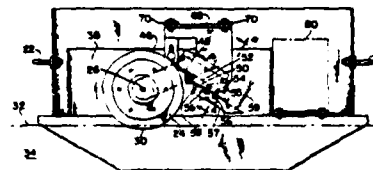
U.S. Cl. 324-65 R

11 Claims

An apparatus which floats on the surface of the water in which oil pollution is to be detected. The apparatus comprises a collector wheel having an oleophilic perimeter surface (such as polyethylene); the bottom portion of this wheel dips below the surface of the water on which the apparatus floats, and as the wheel rotates its perimeter surface picks up water if no oil is present. However, if there is even a small amount of oil on the surface of the water, the wheel perimeter will become coated with oil to the exclusion of water. A collector blade removes the liquid from the wheel perimeter and directs it to a detecting surface having at least two spaced electrodes. A voltage is imposed across the electrodes, and when water is deposited on the detecting surface, it will cause a small current to be conducted. However, when oil is deposited on the detecting surface, no current flows between the electrodes and an alarm system is activated. An oscillating wiper keeps the scraper and detecting surface free of sludge or other impurities.

Keywords: Buoy, instrumented; Pollutant measurement

U.S. Cl. X.R. 340-236



3,800,272

**ROTATING ACOUSTIC SCANNER SYSTEM FOR POSITIONING OBJECTS ON THE OCEAN FLOOR**

Robert D. Hitchcock, Ventura, and Richard J. Malloy, Ojai, both of Calif., assignors to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Aug. 8, 1972, Ser. No. 279,134

Int. Cl. G01s 9/68

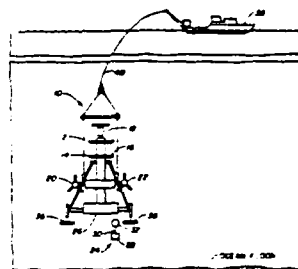
U.S. Cl. 340—3 R

4 Claims

A pair of rotating sonar transducers are mounted on a support structure which is equipped with thruster units for effecting vertical and lateral motion of the system during deployment on the ocean floor. Position accuracy is obtained by deployment of a self-contained benchmark array which is used to establish a reference plot.

Keywords: Instrument deployment; Offshore construction; Seabed site survey; Sonar, side looking

U.S. Cl. X.R. 340-3T



APRIL 2, 1974

3,800,346

**SELF DESCENDING AND SURFACING WATER DEVICE**

Elmer White, 94 E. Marathon Rd., Altadena, Calif.

Filed July 23, 1973, Ser. No. 382,086

Int. Cl. B63b 21/52

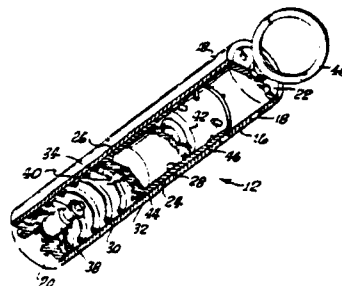
U.S. Cl. 9—8 R

12 Claims

A self descending and surfacing water device for deploying instrumentation, such as a bathythermograph, including a cylinder and piston combination. The cylinder has a water port at its top end. The piston is hollow and has a closed bottom end and an opening at its top end. A spring is provided for biasing the piston upwardly within the cylinder. Water pressure forces the hollow piston downwardly against this spring, and a gas is released for driving the hollow piston upwardly in the cylinder when the device has descended to a predetermined depth. A free floating piston is disposed within the hollow piston, and the bottom of the hollow piston has an aperture so that upon the release of gas the free floating piston is driven upwardly within the hollow piston to increase the buoyancy of the device.

Keywords: Instrument deployment; Instrument retrieval

U.S. Cl. X.R. 9-316; 73-170; 114-50



3,800,542

**FLOATING BOOM**

Nicholas P. Cerasari, Wilmington, Del.

Continuation-in-part of Ser. No. 25,450, April 3, 1970,  
abandoned. This application Aug. 18, 1972, Ser. No. 281,850  
Int. Cl. E02b 15/04

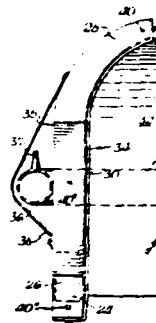
U.S. Cl. 61-1 F

11 Claims

A floating boom for collecting and containing oil and floating debris in the open sea or in rough water composed of a plurality of upright support members having first weighted end and a second inwardly curved upper end, said upright support members being attached to connecting cables, a barricade wall material and a buoyant support tube which are both attached to the upright support members to form the boom. The floating boom can be towed by vessel around an oil spill or mass of floating debris to collect and contain same. The curved upper end of the support member decreases the loss of collected oil and floating debris due to action of waves in rough or open sea. The device is useful for collecting and containing oil and floating debris in the open sea, in rough water or in rivers, lakes, bays and lagoons.

Keywords: Pollutant collection; Pollutant debris; Pollutant, surface barrier

U.S. Cl. X.R. 114-.5



3,800,543

**OFFSET BREAKWATER CONFIGURATION**

Walter L. Moore, Taylor Hall 212-A, Austin, Tex.

Filed June 6, 1972, Ser. No. 260,274

Int. Cl. E02b 3/06

U.S. Cl. 61-5

10 Claims

Motion of a structure subject to the forces of impinging waves is substantially decreased and the transmission of wave motion past such structure accordingly diminished by providing the structure with a plurality of wave reflecting surfaces alternately offset from each other by a distance approximating one-half the wavelength of the impinging waves.

Keywords: Breakwater, floating



3,800,547

**OFFSHORE TERMINAL WITH UNDERWATER FOUNDATION**

Dipak Dutta, Dusseldorf-Rath, and Karl-Gerd Wurker, Hesel, both of Germany, assignors to Mannesmannrohren-Werke Aktiengesellschaft, Dusseldorf, Germany

Filed Mar. 29, 1972, Ser. No. 239,236

Int. Cl. E02b 3/20; E02d 27/52

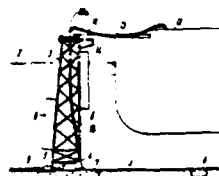
U.S. Cl. 61-46

2 Claims

In an offshore terminal with underwater foundation and underwater pipeline leading from the shore to the foundation, a tower in which a pipe runs up, from the pipeline to connecting facilities at the top; the tower has floatation tanks and is hinged to the foundation for selective erection, whereby the top of the tower projects above the waterline, and for folding down for the tower to lie on the ocean floor. The bottom of the tower when erected, being releasably locked to the foundation.

Keywords: Offshore mooring structure; Offshore platform, fixed

U.S. Cl. X.R. 61-48; 141-387



[illegible]

A detailed technical drawing of a vehicle chassis, viewed from above. The drawing shows the front and rear axles, suspension components, steering knuckles, and the central frame. Various parts are labeled with numbers from 1 to 27. The front axle assembly includes a steering knuckle (1), a shock absorber (2), a coil spring (3), and a lower control arm (4). The rear axle assembly includes a shock absorber (5), a coil spring (6), and a lower control arm (7). The central frame is shown with various mounting points and components labeled with numbers 8 through 27. The drawing is a black and white line drawing with a white background.

3,800,950

# APPARATUS FOR REMOVING OIL FROM WATER

Howard V. Hess, and Edward L. Cole, both of P.O. Box 509, Fishkill, N.Y.

Continuation of Ser. No. 875,579, Nov. 10, 1969, abandoned, which is a continuation-in-part of Ser. No. 804,863, March 6, 1969, abandoned. This application Jan. 8, 1971, Ser. No. 105,074

Int. Cl. E02b 15/04

U.S. Cl. 210-242

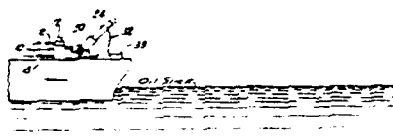
3 Claims

Cleaning up hydrocarbon oil spills on a water surface which involves projecting open cellular particles of a highly oleophilic plastic foam such as polystyrene having a solvent affinity for petroleum substantially equivalent to that of polystyrene foam, to preferentially effect absorption of the oil and the agglomeration of the particles into lumps, mechanically recovering the lumps by screening and thereafter completely burning the oil saturated lumps to finally disposed thereof.

The apparatus for carrying out the method includes a heated foaming vessel supplied with foamable plastic particles and means for projecting the particles, after they have been foamed or expanded, upon oil floating on a water surface. These means include a barrel to which the foamed particles are conveyed as well as propulsive means which disintegrate the foamed particles into relatively small particulates, which are then cast onto the oil. Preferably the oil is surrounded by the foamed particles. The apparatus can be mounted on a barge or other vessel.

Keywords: Pollutant absorption; Pollutant, mechanical removal

U.S. Cl. X.R. 210-DIG.21



3,800,951

# APPARATUS FOR REMOVING A SUBSTANCE FLOATING AS A LAYER ON THE SURFACE OF A BODY OF LIQUID

Jean-Claude Jacques Mourlon, Saint-Germain-en-Laye, and Ernest Marie Rene Dubois, Sceaux, both of France, assignors to Bertin & Cie, Plasier and Entreprise de Recherches et d'Activites Petrolieres-EM, Paris, both of France

Continuation of Ser. No. 887,297, Dec. 22, 1969, Pat. No. 3,635,342. This application Oct. 27, 1971, Ser. No. 192,845. Claims priority, application France, Dec. 23, 1968, 68.180117; Nov. 28, 1969, 69.41273. The portion of the term of this patent subsequent to Jan. 18, 1989, has been disclaimed.

Int. Cl. E02b 15/04

U.S. Cl. 210-242

36 Claims

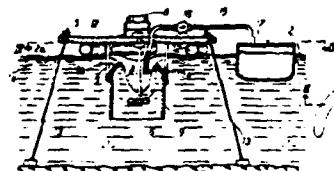
An apparatus for removing from the surface of a body of liquid, an immiscible substance overfloating the same and spread thereover as a layer, said body of liquid and said layer of substance forming distinct horizontal strata, comprising:

means for locally whirling said liquid in the vicinity of said surface about a substantially vertical axis to generate a whirlpool producing in said surface a depression of downwardly tapering closed-bottom cup-shaped outline into which said immiscible overfloating substance is centripetally drawn from the environment of said depression and accumulates in extra thickness compared with said layer; and

means, distinct from said whirling means, for discriminatingly extracting from said depression the immiscible substance accumulated therein, said extracting means including a portion adapted to engage a region of said depression located above the bottom of said depression.

Keywords: Pollutant removal watercraft; Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.21





APRIL 9, 1974

3,802,201

**ROUGH WATER BARRIER**

David P. Hoult, 30 Norwich Rd., Wellesley, Mass., and Jerome H. Milgram, 2 Kelley Rd., Cambridge, Mass.

Continuation-in-part of Ser. No. 79,051, Oct. 8, 1970, which is a continuation-in-part of Ser. No. 54,530, July 13, 1970. This application Jan. 4, 1972, Ser. No. 215,307

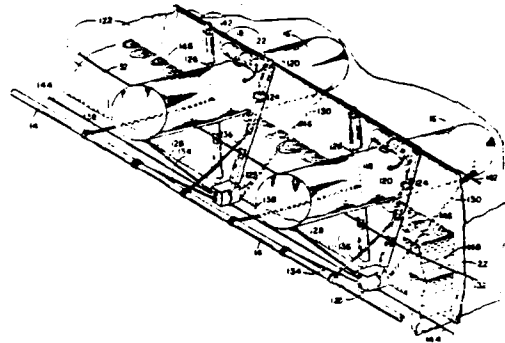
Int. Cl. E02b 15/04

U.S. Cl. 61-1 F

7 Claims

A barrier for use in rough water to contain a material such as oil floating upon the water including a deformable barrier sheet vertically disposed in the water and attached to a supporting and stabilizing structure which comprises a number of vertical supporting elements to which the sheet is attached; stabilizing means, including flotation means and tension controlling means, for maintaining each supporting element in a hydrodynamically stable configuration; and slack control means to maintain slack in the sheet between each pair of adjacent supporting elements.

Keywords: Pollutant, surface barrier



3,802,205

**SEA WALL CONSTRUCTION**

Bryan J. Dickinson, Des Moines, Wash., assignor to Seawall Enterprises, Inc., Des Moines, Wales

Division of Ser. No. 847,386, Aug. 6, 1969, Pat. No. 3,613,382. This application June 7, 1971, Ser. No. 150,469

Int. Cl. E02b 3/08; E02d 5/12

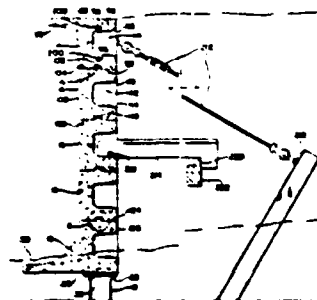
U.S. Cl. 61-49

7 Claims

Modular sea wall structure utilizing steel beam bearing pilings between and on which are supported modular concrete block units. The pilings are driven as deeply as required to give firm support and the bottommost concrete block unit is positioned between and resting on two adjacent pilings at a preselected depth below or above the bottom surface. The top block is post tensioned and the intermediate blocks are designed along with the other structural components to hold the geometry of the wall. All steel parts, namely, pilings and pretensioned cables, are sealed or isolated from the corrosive effects of water and air. Flexibility of movement is maintained between component parts such as blocks and pilings.

Keywords: Concrete block; Pile, steel; Seawall

U.S. Cl. X.R. 52-496; 52-595; 61-4; 61-39



3,802,206  
PILE SPLICER

Robert Fred Moore, 1625 3rd Ave., Picayune, Miss., and Alvin Edward Moore, 916 Beach Blvd., Waveland, Miss.  
Filed Mar. 8, 1972, Ser. No. 232,659  
Int. Cl. E02d 5/26; F16b 7/00

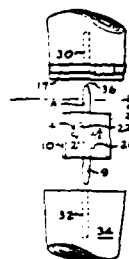
U.S. Cl. 61-53

12 Claims

Splicing means for connecting two wood piles, end-to-end, to make a long pile for transfer of pile-loads to lower, stronger ground. The splicer comprises: at least one plate-like, substantially horizontal element adapted to lie between adjacent pile ends, with optional epoxy glue between upper and lower surfaces of this element and the upper and lower piles; and a central upright dowel member, extending above and below the plate-like element. This plate-like element is in the form of a disk in FIGS. 1 to 3 and 6 to 9; in FIGS. 4 and 5 there are two plate-like elements (the horizontal parts of angle irons, these irons being welded on opposite sides of the dowel); and in FIGS. 10 and 11, the plate-like element has two parts that are at angles to each other and integrally joined at their lower lines of junction (this angle plate being fixed to a V-shaped cut in the lower pile). Preferably, the splicer comprises other pile penetrating and anchoring elements that are fixed to the plate-like element, for example: the piece of six-inch pipe of FIGS. 1 to 7, extending around the disk (or angle irons of FIG. 4), driven into the upper and lower piles; the vertically-extending parts of the angle irons of FIGS. 4 and 5; the prongs of FIGS. 6 and 7, struck-out from the disk; the laterally placed, double-point pins of FIGS. 8 and 9; or the hammer-driven nails or spikes of FIGS. 10 and 11. And preferably the upper pile section of the composite pile is within a tightly clamped metal band, and is at least 30 feet long.

Keywords: Pile section connection; Pile, wood

U.S. Cl. X.R. 287-127; 287-20.92E; 287-20.92L



3,802,697  
WAVE GENERATOR FOR SIMULATED SURFRIDING  
Bernard J. Le Mehaute, 2159 Highland Vista Dr., Arcadia, Calif.

Filed Oct. 14, 1971, Ser. No. 189,219  
Int. Cl. A63g 3/116

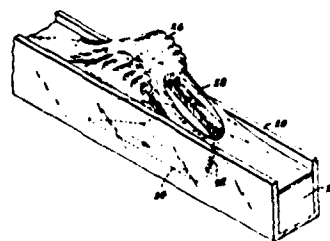
U.S. Cl. 272-17

8 Claims

A wave generator including a water filled channel and a wave forming body positioned in the channel so that water is deflected by the upper surface of the body for simulating to a rider of a boat or surfboard attached to the wave forming body and floating on the top surface of the water the thrill of surfriding while insuring a safe controlled environment. The wave forming body is either movable or stationary as long as movement exists relative to the water; the apparatus may also form part of a surfriding teaching device or boat model testing facility.

Keywords: Wave flume; Wave generator

U.S. Cl. X.R. 4-172.16; 35-19R; 35-29R; 61-1R; 73-148; 272-3; 272-32



3,803,541

**METHOD OF MONITORING OPERATING CONDITION  
OF SUBMARINE CABLE-BURYING DEVICES**

Kaisuke Shiroyama, Yokohama; Takeo Yokoyama, Kamakura; Naoyuki Shimizu, Fujisawa, and Kiyomi Minozawa, Takarazuka, all of Japan, assignors to The Furukawa Electric Company Limited and Furuno Electric Co., Ltd., Minami-takaki-gun, Nagasaki Pref, both of Japan

Filed June 7, 1972, Ser. No. 260,447

Claims priority, application Japan, June 12, 1971, 46-41833  
Int. Cl. G01s 9/68

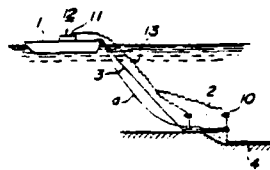
U.S. Cl. 340-3 R

5 Claims

A method of monitoring operating condition of submarine cable-burying devices utilizing ultrasonic wave. The ultrasonic wave is emitted from at least two transmitter-receiver sets arranged on the side of a cable-burying device towards the ground under water and the ultrasonic wave reflected by the ground under water is received and measured by the transmitter-receiver sets to detect the position of the transmitter-receiver sets relative to the ground under water.

Keywords: Seabed cable plow; Sonar, depth sounder

U.S. Cl. X.R. 340-3T



APRIL 16, 1974

3,803,848

**BOOM ARRANGEMENT FOR CONFINING OIL**

Gustaaf Van't Hof, 10021 Lesterford Ave., Downey, Calif.  
Continuation-in-part of Ser. No. 829,303, June 2, 1969, Pat.  
No. 3,611,728. This application Oct. 12, 1971, Ser. No.  
188,313

Int. Cl. E02b 15/04

U.S. Cl. 61-1 F

17 Claims

A vertically floating wall having a generally arcuate plan for confining oil spills or the like in open water is described. Several such arcs may be joined to form a sinuous wall. A pair of walls may be connected to form a V to be towed across an oil spill. A plurality of such walls may be joined end to end to form a polygonal enclosure for oil. The wall is preferably made by a plurality of vertically extending bar-like members having a trapezoidal cross section arranged side by side with the non-parallel sides of the trapezoid in abutment to form a substantially liquid-tight wall. A series of the bars have their narrower sides facing in one direction to form an arc concave in that direction. An adjacent series of bars are similarly abutted to form an arc concave in the opposite direction and such series are successively alternated to form the sinusoidal plan. A prestressing cable extends through in the trapezoidal members along the length of the sinusoidal assembly for applying a force towards the concave side of each of the arcs to thereby form an elastically stable structure.

Keywords: Pollutant collection; Pollutant, surface barrier



3,803,849  
**METHOD AND APPARATUS FOR DAMPING WAVE ACTION**

Frank Allan Bryant, Houston, Tex., assignor to The Offshore Company, Houston, Tex.

Filed July 27, 1972, Ser. No. 275,723

Int. Cl. E02b 3/04

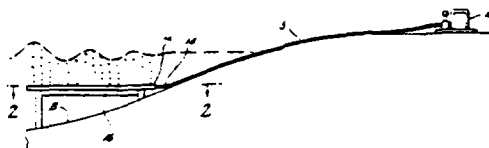
U.S. Cl. 61-1 R

1 Claim

A method of and apparatus for damping wave action on a section of water including injecting sufficient amount of air in discrete, minute bubbles under the water to dissipate a major portion of the wave energy by irreversible thermodynamic compression and expansion of such bubbles. The apparatus includes a supply of air, bubble generating means positioned in the water and having bubble generating elements to generate a multitude of minute, discrete bubbles which are sufficiently small to damp the wave action. This abstract is neither intended to define the invention of the application which, of course, is measured by the claims, nor is it intended to be limiting as to the scope of the invention in any way.

Keywords: Breakwater, pneumatic

U.S. Cl. X.R. 61-6



3,803,852  
**PROCESS FOR BUILDING AN ISLAND**

Rafael Fernandez-Luque, Rijswijk, and Johan M. Goppel, Delft, both of Netherlands, assignors to Shell Oil Company, Houston, Tex.

Filed Apr. 9, 1973, Ser. No. 349,364

Claims priority, application Netherlands, Apr. 11, 1972, 7204805

Int. Cl. E02b 1/00, 3/04, 3/18

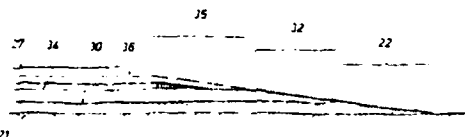
U.S. Cl. 61-46

1 Claims

A foundation is built up in a body of water by depositing artificial seaweed in a specified area on the bottom of the body of water then depositing sand particles in the area defined by the seaweed, and repeating the process in successively smaller areas so that a foundation such as an island is built up.

Keywords: Artificial seaweed; Offshore construction; Offshore island; Seabed foundation

U.S. Cl. X.R. 47-1; 61-2; 61-3; 61-50



3,803,853  
**DOCK FENDER STRUCTURE**

Felix Kuss, Keokuk, Iowa, assignor to Borg-Warner Corporation, Chicago, Ill.

Filed July 24, 1972, Ser. No. 274,351

Int. Cl. E02b 3/22; F16f 1/44

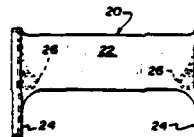
U.S. Cl. 61-48

11 Claims

A marine dock fender element having an elastomeric deflection body in connection with support plates at each end of the deflection body with deflection guide members associated with each support plate and the deflection body.

Keywords: Pier fender

U.S. Cl. X.R. 114-219; 267-140; 267-153



3,803,855

**SUBMERGED OIL STORAGE TANK**

Arick S. Malkiel, 94-09 68th Ave., Forest Hills, N.Y.

Filed Sept. 29, 1972, Ser. No. 293,400

Int. Cl. E02b 17/00; B65d 89/10

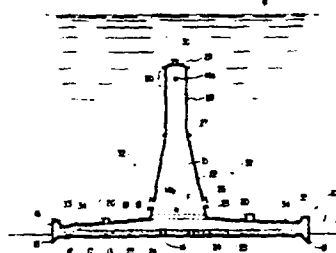
U.S. Cl. 61-46.5

13 Claims

A submerged liquid storage system comprises a foundation base resting on the ocean floor and including a ballastable platform having integrally mounted thereon an upwardly extending tapering hollow shaft interlocking with a tank enclosure comprising an assembly of interconnecting and intercommunicating horizontal and sloping tubular struts braced against said shaft, covered by a flexible sheet of elastomer material serving as an sealed tank wall open on the bottom to sea and forming with the said tubular struts and hollow shaft a liquid storing tank, with the said tank being protected from marine environs by an outer timber envelope.

Keywords: Offshore construction; Offshore storage tank, submerged; Seabed foundation

U.S. Cl. X.R. 114-.5T



3,803,856

**PROCESS AND APPARATUS FOR ACHIEVING THE MECHANICAL TRENCHING OF A PIPE-LINE IN A SUB-AQUEOUS DEPTH**

Giovanni Faldi, via Forese Donati, 27, Firenze, Italy

Filed Dec. 20, 1971, Ser. No. 209,649

Int. Cl. F16l 1/00, E02b 5/02; E02h 3/88

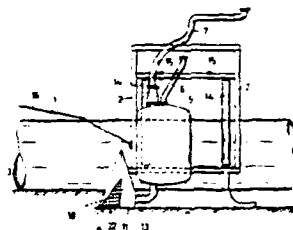
U.S. Cl. 61-72.4

5 Claims

The invention relates to a process and apparatus for the mechanical entrenching of a pipe-line in a sub-aqueous bed, wherein two or more dredging devices are positioned at the two sides of the pipe-line and a bridging framework is provided connecting said dredging devices, said framework being pulled astride the pipe-line while the dredging devices are in action, so that the pipe-line, aided by its own weight, sinks slowly into the trench as it is being dug.

Keywords: Dredge, suction; Dredge intake; Pump; Seabed pipeline placement; Seabed trencher

U.S. Cl. X.R. 37-63



3,804,251

**FLOATAGE COLLECTING APPARATUS AND METHOD**

James H. Farrell; Ralph A. Bianchi, both of Lexington, and Edward E. Johanson, Lynnfield, all of Mass., assignors to JBF Scientific Corporation, Burlington, Mass.

Continuation-in-part of Ser. No. 151,838, June 10, 1971, abandoned. This application Mar. 6, 1972, Ser. No. 231,977

Int. Cl. B01d 21/00

U.S. Cl. 210-83

22 Claims

Apparatus and method for removing floating material from the surface of a body of liquid and for collecting the material has an endless belt-type materials transport mounted, as by rollers with vertically-separated horizontal rotation axes, to dispose the transport with a lower flight inclined downwardly from above the liquid surface at a frontal location to below the surface at a rearward location. A collection well is contiguous behind the rearward location. The transport is driven to advance the lower flight in the direction from the frontal location to the rearward location. This motion carries floating material from the liquid surface downward and rearward under the lower flight of the transport and releases it at the rearward location to float upward into the collection well. A method for floatage collection by steps that the foregoing apparatus performs is also disclosed.

Keywords: Pollutant collection; Pollutant removal watercraft

U.S. Cl. X.R. 210-DIG.21; 210-242; 210-526



APRIL 23, 1974

3,805,515  
MODULARIZED SEA POWER ELECTRICAL  
GENERATOR PLANT

Clarence Zener, Pittsburgh, Pa., assignor to Carnegie Mellon  
University, Pittsburgh, Pa.

Filed June 11, 1971, Ser. No. 152,295

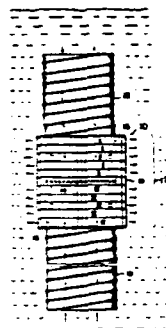
Int. Cl. F02g 1/00

U.S. Cl. 60-641

16 Claims

An electrical generating plant utilizing temperature differentials (thermoclines) between various levels of the ocean having modularized boiler units, condenser units, and engine units which are adapted for assemblage in a stacked array to form a power unit. Any number of power units can be efficiently and economically connected together and attached to a pair of prefabricated pipes to form a generating plant.

Keywords: Electrical generator; Power, submerged source



3,805,534  
SLIDE RESISTANT PLATFORM ANCHOR CONDUCTOR  
SILO

Lee K. Brasted, Metairie, La., assignor to Shell Oil Company,  
Houston, Tex.

Filed May 9, 1972, Ser. No. 251,630

Int. Cl. E02b 17/00; E02d 23/02; B63b 21/26

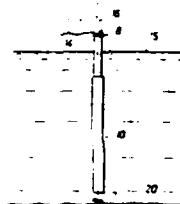
U.S. Cl. 61-46.5

6 Claims

A platform anchor and conductor silo for a slide resistant offshore platform comprises at least two large diameter concrete cylinders joined end to end, said concrete being longitudinally prestressed by a plurality of high strength steel tendons, said platform anchor having removable end closures. The anchor is towed to location and upended with the large diameter end down. When the internal pressure is increased to an amount equal to the external hydrostatic pressure at the lower end, the lower end closure is removed. The anchor is then positioned over the desired location, the internal pressure is reduced, causing an increase in effective weight forcing the anchor into the ocean floor. When the upper closure is submerged and the internal pressure further reduced below hydrostatic, the resulting pressure imbalance provides additional force to drive the anchor into the ocean floor to a substantial depth.

Keywords: Offshore caisson; Offshore construction; Offshore platform anchor

U.S. Cl. X.R. 61-53.5; 61-82; 114-206R



3,805,898

# FOLDING BOTTOM CORE SAMPLER

Solon G. Whitney, Houston, Tex., assignor to Texaco Inc., New York, N.Y.

Filed Dec. 26, 1972, Ser. No. 317,910

Int. Cl. E21b 7/12, 11/02

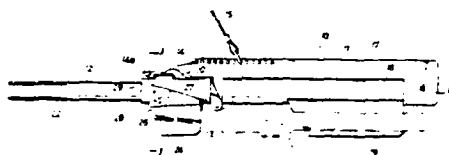
U.S. Cl. 175-5

18 Claims

A bottom core sampler comprises a forward elongated hollow core barrel pivotally connected to a rearward, ventral fin stabilized, elongated, weighted tubular main body having a tow cable attached thereto. The pivotal connection includes a weak link for breaking after partial penetration of the downward pivoting core barrel into the bottom permitting deeper penetration by the angular push thereon by the main body. Two valves are provided for expelling water as the bottom core sample is driven into the core barrel. Continued upward pull of the tow cable withdraws the bottom core sample laden core barrel and pivots it down and back against the main body for returning to the surface with the valves closed for retaining the bottom core sample in the core barrel.

Keywords: Instrument retrieval; Sampler, seabed-driven core

U.S. Cl. X.R. 175-20; 175-244



3,806,863

# METHOD OF COLLECTING SEISMIC DATA OF STRATA UNDERLYING BODIES OF WATER

Aubra E. Tilley; Roger D. Judson, both of Houston, Tex., and Robert J. S. Brown, Fullerton, Calif., assignors to Chevron Research Company, San Francisco, Calif.

Continuation of Ser. No. 199,910, Nov. 18, 1971, abandoned, which is a continuation-in-part of Ser. No. 787,917, Dec. 30, 1968, abandoned. This application June 6, 1973, Ser. No. 366,384

Int. Cl. G01v 1/38

U.S. Cl. 340-7 R

22 Claims

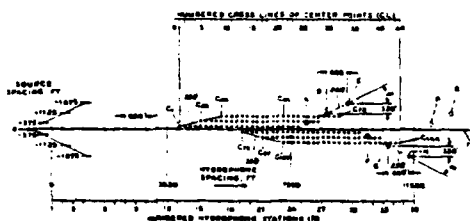
In accordance with the present invention, two-dimensional subsurface coverage is obtained with a continuously moving marine seismic exploration system including repetitive seismic sources mounted aboard first and second shooting boats and a plurality of hydrophones trailing behind a separate recording boat flanked by the shooting boats. The seismic source of one of the shooting boats is fired at a repetitive time interval as that shooting boat traverses the flanking zigzag course line including a firing leg, or segment, oblique to the base course of the recording boat. Preferably, the shooting boat traverses the zigzag course line at a velocity  $V'$  equal to

$$V/\cos \alpha$$

where  $V$  is the velocity of the recording boat along the base course line and  $\alpha$  is the included angle between the base line and the oblique firing leg of the zigzag course of the shooting boat. The shooting boat proceeds along the firing leg from a position near to the base course of the recording boat to its sideways extreme position, or vice versa.

Keywords: Seismic record processor; Seismic survey method

U.S. Cl. X.R. 340-15.5TL



APRIL 30, 1974

3,807,066

**CUTTER HEAD FOR SUCTION DREDGE**

Norman P. Proehl, 373 Westminster Ave., Lake Forest, Ill.

Filed Nov. 29, 1972, Ser. No. 311,013

Int. Cl. E02f 3/92

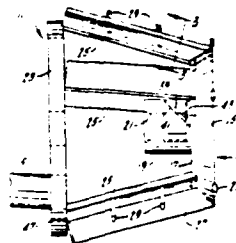
U.S. Cl. 37-67

4 Claims

A truncated, conical cutting head for a suction dredge constructed of simplified wearing parts and strength members which may be easily assembled and removed for replacement. The cutter head has blades directly attached to strengthening struts with the blades inclined in the direction of rotation of the head. Cutter teeth which extend radially outwardly beyond the blades are also attached directly to the struts. Both the struts and the blades are formed of straight pieces of material of conventional cross-sections such as rectangular or square, which have been cut to fit. Lifter plates are provided in the cutter head between the hub and the blades to move material to the inlet of the suction mouth.

Keywords: Dredge, cutterhead; Dredge intake

U.S. Cl. X.R. 37-189



3,807,177

**FLOATING BOOM STRUCTURES**

Per Olof Oberg, Nordmaling, Sweden, assignor to Sanera Projecting Aktiebolag, Nordmaling, Sweden

Filed Dec. 15, 1971, Ser. No. 208,313

Claims priority, application Sweden, Oct. 15, 1971, 13108/71

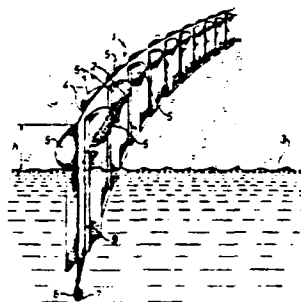
Int. Cl. E02b 15/04

U.S. Cl. 61-1 F

12 Claims

A boom structure for collecting and screening off impurities located on an at the surface of contaminated water. The boom has a curtain of clothlike material depending substantially vertically in the water and supported by buoyant bodies and maintained in a substantially vertical position by weights attached preferably to the lower edge of the curtain. The buoyant bodies comprise hermetically sealed buoyant bags attached to one or both sides of the curtain and constructed of soft cloth material which is impermeable to liquid. The bags when not influenced by water pressure are flat and of substantially uniform thickness. The buoyant bags enclose a constant quantity of gas, preferably air, and are attached to the curtain such that the quantity of gas enclosed in each buoyant bag when subjected to water pressure as the boom is placed in the water can be freely pressed up towards an upper portion of the buoyant bag to create in said portion a balloon-like swelling.

Keywords: Pollutant, surface barrier





3,807,178  
FLOATING BOOM

Neel D. Tankley, Walnut Creek, Calif., assignor to Pacific Pollution Control, San Francisco, Calif.

Filed June 16, 1972, Ser. No. 263,522

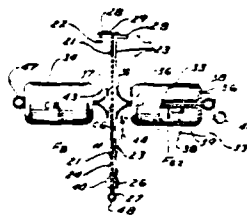
Int. Cl. E02b 15/04

U.S. Cl. 61-1 F

16 Claims

A floating boom is disclosed which includes an elongated sheet-like partition member and a plurality of float means demountably secured to the partition member in relatively spaced apart positions thereon. The float means are formed for rapid and easy attachment to the partition as it is unrolled from a reel during deployment of the boom and for rapid removal from the partition member when the boom is retrieved. The float means each are preferably provided with a relatively thin frame and a clamping means formed to allow selective clamping and release of a movable portion of the frame into and out of engagement with the partition sheet. The float elements are secured to the frame in an outrigger type of construction, which enhances stability of the water and provides a channel between the floats and the partition for passage of oil and water therebetween. A method of forming and deploying the floating boom and connecting the same with similar floating booms is also disclosed.

Keywords: Pollutant, surface barrier



3,807,179  
DEICING SYSTEMS

Virgil D. Stone, Miami, Fla., assignor to Gulf Oil Corporation, Pittsburgh, Pa.

Filed Oct. 2, 1972, Ser. No. 294,333

Int. Cl. E02b 3/00, 17/00; B63b 35/08

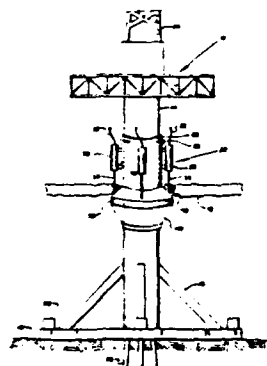
U.S. Cl. 61-1

8 Claims

Apparatus for protecting columns of offshore structures from dynamic forces of ice in which a plurality of upwardly movable ice-lifting elements are supported around the column and means are provided for moving the elements upwardly against the ice to break large blocks of ice from the icepack. The ice-breaking elements may be combined with inclined planes adapted to exert upward forces on the ice.

Keywords: Ice protection; Offshore platform, leg; Offshore structure fender

U.S. Cl. X.R. 61-46; 114-40



3,807,234

**CORE CATCHER FOR CORE SAMPLERS**

Terry L. Duperon, Saginaw, Mich., assignor to Trippensee Corporation, Saginaw, Mich.

Filed Aug. 14, 1972, Ser. No. 280,522

Int. Cl. G01n 1/08; E21b 9/20

U.S. Cl. 73-425.2

9 Claims

A core catcher for a core sampler has a hollow, semi-ellipsoidal body adapted to be fitted into a sample tube and being open at one end to permit material to be sampled to pass into the tube through the body. The body is slit axially from its other end to form a plurality of resilient, flexible, longitudinally and transversely arched fingers which may be flexed outwardly or away from one another as material to be sampled passes through the body. The fingers have convex, free ends which terminate short of one another to minimize scoring of the sample. The fingers are of such length as to enable their free ends to be deflected inwardly of the body into overlapping relation to form a support for material in the tube.



Keywords: Sampler, seabed-driven core

U.S. Cl. X.R. 175-249

3,808,031

**MULTI-METAL CORROSION-RESISTANT DIFFUSION COATINGS**

Harry Brill-Edwards, San Antonio, Tex., assignor to Chromalloy American Corporation, West Nyack, N.Y.

Division of Ser. No. 733,303, May 31, 1968, Pat. No.

3,642,457. This application July 28, 1971, Ser. No. 167,030

Int. Cl. B44d 1/46

U.S. Cl. 117-71 M

5 Claims

A method is provided herewith for the production of multimetal diffusion coatings on metal articles providing prolonged protection against chemical or galvanic corrosion of the surface of the coated article during prolonged exposure to corrosive conditions, and particularly high saline content marine atmospheres, especially where the protective coating is also subjected to mechanically erosive and abrasive environments, with the multiplicity of coating metals being selected so that the combination thereof provides a coating varying through the thickness thereof from outer surface toward the interface of coating layer and coated article so that the mechanical resistance to chemical corrosion is greatest at the outer surface but decreases as the coating thickness is eroded away, while the components of the coating offering sacrificial or cathodic protection are more concentrated adjacent the coating-article interface so that cathodic protection of the coated article increases as the coating is removed by abrasion or erosion. As illustrative, the outer coating surface includes a high concentration of metallic components inherently resistant to saline corrosion and/or abrasion, although offering less cathodic protection for the coated article; while inner layers of the coating are rich in metallic components offering high sacrificial or cathodic protection, although less erosion or saline corrosion resistance.

Keywords: Coating; Corrosion prevention

U.S. Cl. X.R. 29-196.2; 29-196.5; 29-196.6; 117-130R; 204-37R; 204-147

No Figure

3,808,445

**WAVE OPERATED POWER PLANT**

Wayne Bailey, c/o Wayne Bailey Enterprises, Box 89,  
Schaghticoke, N.Y.

Filed Aug. 2, 1972, Ser. No. 278,644

Int. Cl. F03b 13/12

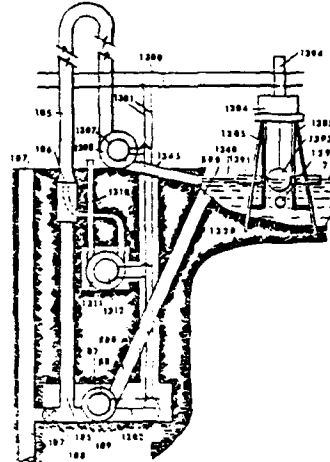
U.S. Cl. 290-42

1 Claim

Keywords: Electrical generator; Power,  
submerged source; Power, wave

U.S. Cl. X.R. 290-53

Developing and changing kinetic energy (motion) into potential dynamic energy continuously and non-poisonously, is the subject of this disclosure, particular attention being given to establishing a continuous water power producing circuit between a water source near the ground level, and a hydro-electric power plant deep down in the ground. Water rising from the deep hydro-electric power plant is pushed much higher than ground level by compressed air from which high point it falls through another hydro-electric power plant to be returned to its water source, and repeat its performance.



MAY 7, 1974

3,808,716

**DREDGE CUTTER HEAD**

Adalbertus Raphael Maria Verbeek, Heemstede, Netherlands,  
assignor to Van Hattum en Blankevoort B.V., Beverwijk,  
Netherlands

Filed Feb. 11, 1972, Ser. No. 225,554

Claims priority, application Netherlands, Feb. 11, 1971,  
7101833

Int. Cl. E02f 3/92

U.S. Cl. 37-67

7 Claims

Keywords: Dredge, cutterhead; Dredge intake

U.S. Cl. X.R. 37-142R

A cutter head construction for use in a cutter dredger, comprising a plurality of spiral-helical arms which on one end join together at a hub and on the other are connected by means of a supporting ring, to which arms are secured lateral ground working teeth each consisting towards their operative ends of a tooth crown extending from a tooth crown base, the representative tooth tips of which crowns, defined as the points halfway the tip or the middle of a cutting rib formed at the free end of the unworn tooth crown and the projection on the axis of the tooth crown of the centre of the wearing surface of the worn tooth crown, together define an imaginary enveloping plane in the form of a plane of revolution co-axial with said hub and said ring.



3,808,820  
**PILE DRIVING UTILIZING STANDING WAVE  
 VIBRATIONS**

Albert G. Bodine, 7877 Woodley Ave., Van Nuys, Calif.  
 Filed Sept. 29, 1972, Ser. No. 293,479  
 Int. Cl. E02d 7/18

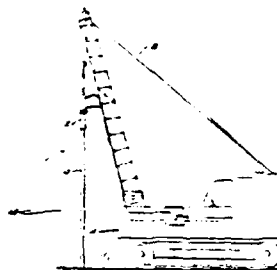
U.S. Cl. 61-53.5

3 Claims

A pile is driven into the earth by means of vibrational energy which is applied to the pile near one end thereof, at a frequency such as to set up resonant standing wave vibration in the pile. Means are provided to assure that the standing wave pattern has a velocity node shifted toward the driving end thereof and a velocity antinode near the driven end thereof. This end result is achieved by first driving the pile into the ground a short distance with a limited amount of vibrational force and with limited bias force being applied by the pile against the earth. When the pile has penetrated to a depth where lateral vibrations thereof are damped by the earthen material, the vibrational drive power is increased to cause the standing wave vibration with velocity nodes and antinodes as mentioned above.

Keywords: Pile driver, vibratory

U.S. Cl. X.R. 173-49; 175-55; 175-56



MAY 14, 1974

3,810,363  
**PILE WITH REINFORCED LEADING END**

John M. Dar Conte, Brooklyn, N.Y., assignor to Manhattan College, Bronx, N.Y.  
 Filed Nov. 20, 1972, Ser. No. 307,996  
 Int. Cl. E02d 5/28

U.S. Cl. 61-53

6 Claims

This disclosure teaches a pile preferably with an H-shaped cross section and having flanges at its leading end reinforced by at least one weld bead. Each of the flanges has a leading end margin and side margins perpendicular thereto so as to form corners. Each of the flanges also includes a median midway between the side margins. Preferably three beads are provided on each flange, each bead in the form of a chevron with an apex on the median and terminating at the corners. According to one preferred embodiment, one of the chevrons has an inclination of about 20°, one about 45° and one about 65°.

Keywords: Pile-driving shoe; Pile, steel

U.S. Cl. X.R. 52-740; 61-60



3,810,835

# PROCESS FOR TREATING OIL SLICKS USING CHEMICAL AGENTS

Richard L. Ferm, Lafayette, Calif., assignor to Chevron  
Research Company, San Francisco, Calif.

No Drawing. Filed Feb. 25, 1971, Ser. No. 119,036

Int. Cl. C02b 9/02

U.S. Cl. 210—59

8 Claims

Keywords: Pollutant coalescence; Pollutant  
collection

U.S. Cl. X.R. 210-DIG.21; 252-312

A process for treating an oil slick to contain it and prevent its uncontrolled spreading comprising applying to open water areas in the vicinity of the oil spill a chemical agent which repulses the oil spill. By judicious application of the chemical agent, the oil slick can be gathered into a limited area which facilitates cleanup. The chemical agent is selected from the group consisting of (1) N,N-dialkyl amides; (2) n-alkyl and n-alkylene monoethers of (a) ethylene glycol and (b) polyethylene glycol; (3) polyethylene glycol monoesters of n-alkyl acids; and (4) n-alkyl and n-alkylene monoesters of propylene glycol.

No Figure

MAY 21, 1974

3,811,285

# FLOATING ANTI-POLLUTION BARRIER DEVICE

Louis Ballu, Colombes, France, assignor to Pneumatiques  
Caoutchouc Manufacture et Plastiques Kleber-Colombes,  
Paris, France

Filed June 9, 1972, Ser. No. 261,410

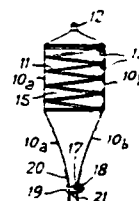
Int. Cl. E02b 15/04

U.S. Cl. 61—1 F

24 Claims

Keywords: Pollutant, surface barrier

A floating anti-pollution barrier for use in water which is constituted by a skirt-like element immersed in the water and supported by floating elements which are constituted by air-tight pockets whose openings face in the downward direction when installed in the water; the pockets are thereby connected with one another by bands of flexible fabric.



3,811,287

# BOTTOM AND BANK FACING

Jan Gerrit De Winter, Lijsterstraat 18, Enschede, Netherlands  
Continuation-in-part of Ser. No. 721,784, April 16, 1968,  
abandoned. This application Aug. 10, 1971, Ser. No. 170,607

Claims priority, application Netherlands, Apr. 17, 1967,  
6705380; Nov. 2, 1967, 6714909

Int. Cl. E02b 3/12

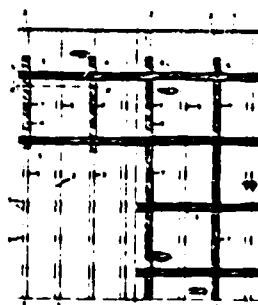
U.S. Cl. 61—38

11 Claims

Keywords: Fabric mat; Seabed scour protec-  
tion; Slope protection

U.S. Cl. X.R. 161-48; 161-49; 161-50;  
161-53; 161-78; 161-89; 161-91

A bottom and bank facing for preventing erosion of sub-aqueous soil structures comprising a lattice of fascines fastened to a mat of synthetic resin material, wherein the resin material comprises a fabric sheet having means attached thereto for use in securing the fascines to the fabric, such means including transversely spaced groups of threads, each group being woven into the fabric at spaced portions along their length to provide resultant loops or floating portions in each group of threads to which the fascines are attached; or separate strips of fabric fastened to the fabric sheet for being tied to the fascines.



3,811,289

# METHODS OF GROUTING OFFSHORE STRUCTURES

Max Bassett, South Houston, Tex., assignor to C. Nelson Shields, Jr., trustee, Houston, Tex.

Continuation of Ser. No. 175,184, Aug. 16, 1971, abandoned, which is a continuation-in-part of Ser. No. 858,951, Sept. 18, 1969, Pat. No. 3,601,999. This application Apr. 16, 1973, Ser. No. 351,261

Int. Cl. E02b 17/00; E02d 5/24; E02b 17/00

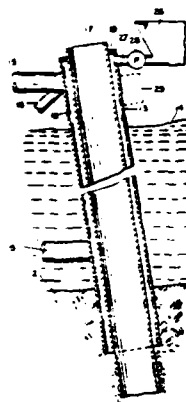
U.S. Cl. 61-46

5 Claims

A predetermined amount of grouting material is introduced from the top into an annular space between a piling and a jacket of a supporting leg of an offshore structure. The amount of the material is sufficient to displace water from the space through the lower end of the jacket, and when the material sets, it forms a plug in the bottom portion of the annular space. Additional grouting material is then introduced to fill the upper portion of the annular space and is allowed to set.

Keywords: Grouting; Offshore construction; Pile, structure connection

U.S. Cl. X.R. 61-53.52; 61-53.6; 61-54



3,811,325

# APPARATUS FOR COLLECTING SURFACE PARTICLES ON BODY OF WATER

Lyle Carter, 1903-33rd Ave., Oakland, Calif.

Filed Oct. 30, 1972, Ser. No. 302,215

Int. Cl. G01n 1/10

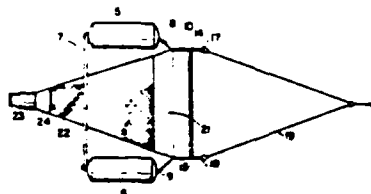
U.S. Cl. 73-425.4 R

11 Claims

An apparatus for sampling and collecting floating particulate matter on the surface of a body of water has parallel spaced apart longitudinal floats supporting a rigid tubular frame. Secured to the frame are two parallel, horizontal hydrofoil bodies spaced apart from each other to form an intake opening. A funnel-shaped net with its wide end secured to the intake opening and its narrow end terminating in a collecting screen collects surface particulate matter which is caused to flow into the intake opening as the apparatus is towed on a body of water. The lower hydrofoil body maintains the intake opening at a predetermined depth below the water surface, while the upper hydrofoil body enables the apparatus to ride over swells.

Keywords: Instrument deployment; Pollutant collection; Sampler, surface

U.S. Cl. X.R. 114-235B



3,812,455  
MARINE SEISMIC STREAMER CONNECTOR  
STRUCTURE

Raymond H. Pearson, Richardson, Tex., assignor to Whitehall Electronics Corporation, Richardson, Tex.

Filed Jan. 16, 1973, Ser. No. 324,122

Int. Cl. G01v 1/00, H04b 13/00

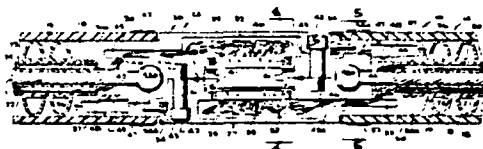
U.S. Cl. 340-7 R

14 Claims

A multi-section marine seismic streamer construction wherein each streamer section has identical couplers at opposite ends. The couplers have a partly separable cylindrical end portion interfitted in the streamer outer jacket and clamped about a strain cable anchor head and an end portion of a trunk cable running through the section. The couplers also have semi-cylindrical portions to mate with like portions of companion couplers along a diametric plane of the streamer, with male and female electrical plugs in plug cavities in the mating portions coupled together, and mounting bolts perpendicular to the diametric plane securing the mating portions together.

Keywords: Seismic streamer cable

U.S. Cl. X.R. 339-49R; 339-94R



MAY 28, 1974

3,812,968  
DEVICE FOR RECOVERING FLOATING MATTER FROM  
WATER SURFACE

Kuninori Aramaki, Yokohama; Hiroshi Kawakami, Kamakura, and Yasuharu Kawaguchi, Yokohama, all of Japan, assignors to Bridgestone Tire Company Limited, Tokyo, Japan

Filed June 9, 1973, Ser. No. 367,617

Claims priority, application Japan, June 10, 1972, 47-57321; July 26, 1972, 47-74799

Int. Cl. B01d 35/02

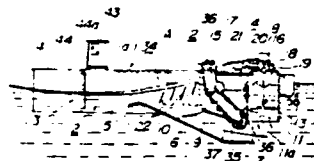
U.S. Cl. 210-242

7 Claims

A ship-like device for recovering pollutant from water surface by forcing the pollutant-carrying water into a downwardly-directed bucket, so that the pollutant floats on calm water surface defined therein and a suction means collects the pollutant therefrom. A wind generator may be disposed within the bucket.

Keywords: Pollutant absorption; Pollutant, mechanical removal; Pollutant removal watercraft; Pollutant, suction removal

U.S. Cl. X.R. 210-83; 210-DIG.21



3,812,973  
COMPOSITION OF MATTER FOR CONTROLLING OIL  
POLLUTION AND PREFERABLY OIL DISCHARGE IN  
WATER

Leif Einar Stern, Malmo, Sweden, assignor to Kritbruksholaget I Malmo AB, Malmo, Sweden

Filed Mar. 22, 1972, Ser. No. 236,964

Claims priority, application Sweden, Apr. 6, 1971, 4441/71

Int. Cl. E02b 15/04

U.S. Cl. 210-502

4 Claims

A fibrous composition of matter for controlling oil pollution and preferably oil discharges in water comprises fibers which consist of a mixture of paraffin and polyethylene in a preferred ratio of from about 50:50 to about 60:40 and which have been obtained from a molten mixture of paraffin and polyethylene.

Keywords: Pollutant absorption

U.S. Cl. X.R. 210-505; 210-DIG.21

No Figure

JUNE 11, 1974

3,815,267  
METHOD AND APPARATUS FOR SUCKING UP  
MATERIAL FROM THE BOTTOM OF A BODY OF  
WATER

Johannes Bertus Laarman, Zwijndrecht, Netherlands, assignor to N.V. Industriële Handelscombinatie Holland, Rotterdam, Netherlands

Filed Sept. 15, 1972, Ser. No. 289,292

Claims priority, application Netherlands, Sept. 23, 1971, 7113102

Int. Cl. E02f 3/88

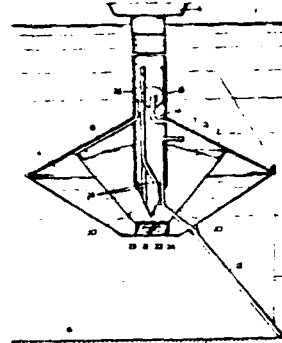
U.S. Cl. 37-58

8 Claims

Material is sucked up from the bottom of a body of water through a suction pipe into a wholly submerged container. The container is filled with water to submerge and trim the container, and this water is pumped out to create the suction that raises the material and to balance the added weight of the material so that the container remains at a constant depth. Material is discharged in a stream of water upwardly from the bottom of the container, and water is simultaneously admitted to the ballast tanks to maintain the container submerged. The container is in the form of two conical frusta that open into each other and are traversed by a vertical shaft for the various conduits. The container for the material is centrally disposed and the ballast tanks are peripherally disposed.

Keywords: Dredge, suction; Dredge, submerged; Dredge-spoil transport; Hopper barge

U.S. Cl. X.R. 37-72; 37-195; 37-DIG.8; 302-14



3,815,371  
OFFSHORE TOWER APPARATUS AND METHOD  
Albert M. Koehler, Houston, Tex., assignor to Brown & Root, Inc., Houston, Tex.  
Division of Ser. No. 30,098, April 20, 1970, Pat. No. 3,668,876. This application Mar. 27, 1972, Ser. No. 238,167  
Int. Cl. E02d 7/00, 5/74  
U.S. Cl. 61-46.5  
5 Claims

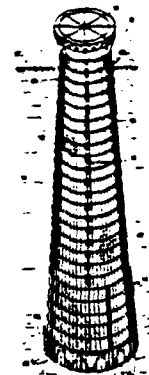
A tower suitable for use in offshore well operations and the like including a plurality of sloping jacket legs extending from the bed of the body of water to a position above the surface of the body of water for supporting a platform thereupon. The jacket legs are reinforced by a surrounding shell of diamond patterned cross braces and a plurality of girder rings lying in a plurality of planes normally with the central axis of the tower. The girder rings are supported against deformity by a bicycle spoke reinforcing system at each girder ring level.

The method aspects of the invention include constructing the tower in a generally horizontal posture upon a plurality of generally upright columns. The construction steps include forming a plurality of girder rings and erecting the girder rings upon the columns. Jacket legs are connected between adjacent girder rings along the length of the offshore tower and the tower legs are enclosed within an outer shell of cross bracings. The offshore tower, following construction, is launched into a body of water for transportation to a selected marine site by constructing the tower longitudinally upon a rail having one end thereof lying adjacent a sheet pile wall which permits the lower end of the rail to be positioned below the adjacent water level. A floatation system connected to the tower and the wall is removed to permit the base of the tower to be buoyantly lifted from the construction support. The upper portion of the tower rests upon a rail bearing guide bracket which is initially positioned above the water level. The

Keywords: Offshore construction; Offshore platform, fixed; Pile placement

U.S. Cl. X.R. 61-53.5; 173-1

rail bearing guide bracket may be lifted off the rail by an incompressible fluid and the tower slides into the body of water. Alternatively, the tower may be jacked into the water by conventional jacking devices. Upon being erected at an offshore location, conductors may serve in a dual capacity as conductors and piles, or piles may be inserted into skirt pile casings surrounding the base of the tower and driven into the bed of the body of water by a stinger guided by a rotating truss.





3,815,372

# MARINE STRUCTURE

George E. Mott, Metairie, La., assignor to Texaco Inc., New York, N.Y.

Filed May 18, 1972, Ser. No. 254,777

Int. Cl. E02b 17/00

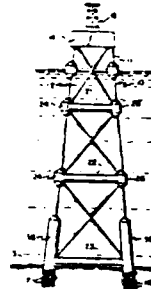
U.S. Cl. 61—46.5

5 Claims

The invention relates to a marine structure or foundation of a type that rests on, and is firmly fixed to the floor of an offshore body of water. The structure comprises a plurality of substantially vertically disposed legs which are laterally connected by a series of cross members to form an open unit. At least a segment of the respective legs and cross members are controllably buoyant whereby the structure can be floated to a submerging site. The legs and cross members are further interconnected at an enlarged joint adapter which serves to guide piles along the respective legs as the piles are being driven.

Keywords: Offshore platform, fixed; Offshore platform, leg; Pile placement

U.S. Cl. X.R. 52-638



3,815,373

# PILING CLAMP

Davis W. Giroux, 3 Lakewood, Council Bluffs, Iowa 51501

Filed June 7, 1972, Ser. No. 260,419

Int. Cl. E02d 7/00

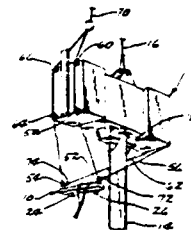
U.S. Cl. 61—53.5

10 Claims

A piling clamp means is disclosed herein which is adapted to be used in combination with a piling pulling apparatus such as a vibrating hammer suspended from the hoist line of a crane. The clamp means comprises a pair of hydraulically operated jaw members which may be moved into gripping engagement with the piling being pulled. The clamp means is suspended from a cable means connected to the vibrating hammer and the crane whip line to enable the clamp means to be moved from a position remote of the piling being pulled to a position adjacent the piling being pulled so that the jaw members may grip the same.

Keywords: Pile driver, vibratory; Pile extractor

U.S. Cl. X.R. 173-91; 214-658; 279-4; 294-88



3,815,422

# MULTI-CAPACITY WATER SAMPLER

Shale J. Niskin, 2629 S. Bayshore Dr., Miami, Fla. 33133

Filed June 4, 1973, Ser. No. 366,771

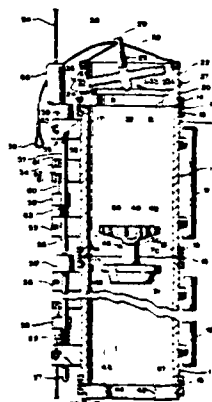
Int. Cl. G01n 1/12, 1/08

U.S. Cl. 73—425.4 R

8 Claims

A water sampler device for obtaining samples of ocean water at designated depths consisting of a plurality of tubular members of identical shape and size clamped together to form a receptacle of any desired capacity with a closure or valve for both ends of the receptacle yieldingly maintained away from the upper opening to permit sea water to flow through the receptacle as it is lowered and sinks to the desired depth of water. Upon release of a messenger, the closures are released simultaneously whereby the lower closure passes through the upper opening to become seated on the lower opening while the upper closure seats on the upper opening to be locked in position by a plurality of cams. The weight of the water trapped in the receptacle maintains the lower cap in a sealed position on the lower opening as the sampler is brought to the surface of the ocean.

Keywords: Sampler, water



3,815,751

**OIL/WATER SEPARATION AND RECOVERY SYSTEM**  
**Jack D. Pavlovic, Oakland, Calif., assignor to Pollution**  
**Recovery Systems, Oakland, Calif.**

Filed Oct. 6, 1971, Ser. No. 187,038

Int. Cl. E02b 15/04

U.S. Cl. 210-242

6 Claims

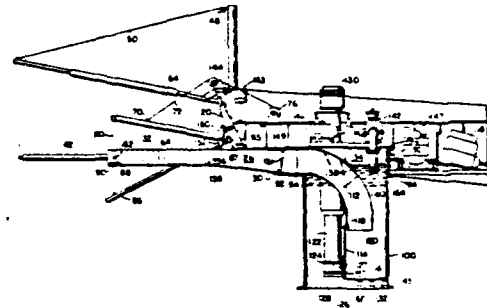
Apparatus is provided for separating fluids of different densities, where the fluids have a substantially continuous common interface. A separating tank is provided having first and second sections, partially separated by a wall extending across the tank and having a height substantially less than the height of the tank, so as to allow communication between the sections. An intake channel directs the flow of fluids downwardly, permitting contact between the lower density fluid flowing in the channel and a layer of the lower density fluid maintained in the tank, so as to capture the major portion of the entering lower density fluid. The higher density fluid plus entrained lower density fluid is directed downwardly into the second section and assumes a tortuous path over the wall into the first section, while the lower density fluid escapes upwards into the layer of the lower density fluid. Means are provided in a lower portion of the first section for continuously removing the fluid of higher density, while means are provided in an upper portion of the tank for continuously removing the fluid of lower density.

In a preferred embodiment the separating tank is mounted in a vessel below fluid level and the intake channel connected to a flexible articulated trough which is controlled to maintain a relatively constant level of fluid, until the fluid reaches the downwardly curving portion of the channel.

Also, a flexible boom is provided for containing the oil or other fluid in anticipation of or during the removal and separation operation.

Keywords: Pollutant collection; Pollutant removal watercraft; Pollutant, suction removal; Pollutant, surface barrier

U.S. Cl. X.R. 210-DIG.21



JUNE 18, 1974

3,817,040

**PILE DRIVING METHOD**

**Elbert M. Stevens, 1000 N. Alamo, San Antonio, Tex. 78215**

Filed July 3, 1972, Ser. No. 268,516

Int. Cl. E02d 7/18; B63b 21/26

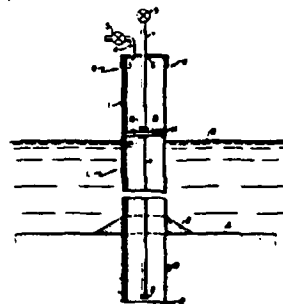
U.S. Cl. 61-53.5

8 Claims

A method for driving tubular piling into ground beneath water in which the end of the piling is sealed against the ground and a vacuum is applied in the upper end of the piling to draw the piling downward and to draw a portion of the ground into the piling. Thereafter, the piston effect may be used to adjust the level of the piling.

Keywords: Offshore construction; Pile driver, water jet; Pile, steel; Seabed foundation; Pile footing

U.S. Cl. X.R. 114-206; 175-20



3,817,091

**PILE DRIVER DRIVE CAP**

Leonard L. Frederick, 15 Crestview Ter., Whippany, N.J.  
07981

Filed May 11, 1971, Ser. No. 142,174

Int. Cl. G01n 33/24

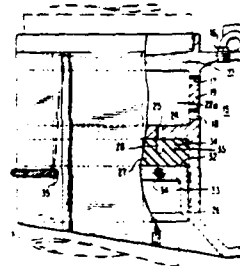
U.S. Cl. 73-84

17 Claims

A water-cooled drive cap for use with pile driving machines which also includes a sensing construction actuatable either electrically or pneumatically to provide an indication of the force of the blow of the hammer of the pile driver and thereby prevent overdriving of the pile and to determine the static load bearing capacity of the pile.

Keywords: Pile driver, impact; Pile load measurement

U.S. Cl. X.R. 73-12; 73-141A; 173-139



3,817,201

**OUTRIGGER FOR MOORING OF BOATS**

Klas Olof Tellberg, Rattarbacken 6, Saltsjö-Duvnäs, Sweden

Filed Jan. 28, 1972, Ser. No. 221,578

Claims priority, application Sweden, Jan. 29, 1971, 1121/71

Int. Cl. B63b 21/00

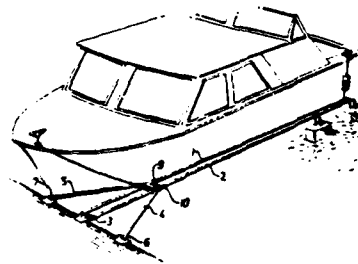
U.S. Cl. 114-230

4 Claims

Boat mooring outrigger comprising a boom attachable perpendicularly to a quay, the end of the boom facing the quay having cross-stays extending at an angle to the boom and attachable to the quay, the cross-stays being detachably fitted to the boom by means of fastenings partially gripping around the boom and mating with the boom by means of a fixing device which, through the action of a locking device, fixes the position of the fastenings relative to the boom.

Keywords: Small-craft mooring device

U.S. Cl. X.R. 24-81CC; 248-226R



3,817,335

# AIRGUN REPEATER POWERED PILE DRIVER

Stephen V. Chelminski, West Redding, Conn., assignor to Bolt Associates, Inc., Norwalk, Conn.

Filed Nov. 28, 1972, Ser. No. 309,995

Int. Cl. E02d 7/10

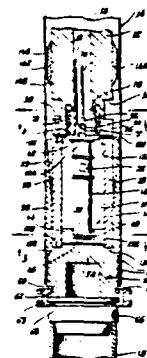
U.S. Cl. 173-127

10 Claims

An airgun repeater powered pile driver embodying the present invention is capable of driving piles of various types and sizes including immense piles to be driven down into the earth and can be operated totally submerged, partially submerged or entirely in the air. A first driving impulse down upon the pile commences when the airgun repeater is fired into a discharge chamber and continues for a relatively long time interval while the discharge chamber wall of great strength remains effectively telescoped within a closely surrounding sleeve as the massive weight above the airgun moves upwardly. Thereafter, the released high pressure gas intermixed with water can escape upwardly between the rim of the discharge chamber wall and the surrounding sleeve. A second driving thrust is provided when the rim of the discharge wall impacts down with respect to a driving head at the bottom of the surrounding sleeve. The pile driver can also be operated within the bore of very large diameter piles.

Keywords: Offshore construction; Pile driver, impact

U.S. Cl. X.R. 61-53.5; 91-4R; 91-325; 92-169  
173-132; 173-136



3,817,385

# METHOD AND A DEVICE FOR COLLECTING SUBSTANCES FLOATING IN A LIQUID SURFACE

Hans Leopold Bergman, Vallatorg 81, Stockholm, Sweden

Filed Apr. 1, 1971, Ser. No. 130,300

Claims priority, application Sweden, Apr. 13, 1970, 4994/70

Int. Cl. E02b 15/04

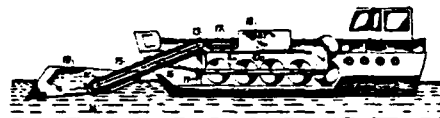
U.S. Cl. 210-242

5 Claims

A method and an apparatus for collecting substances floating in a liquid surface, especially oil and other sticky liquids in a water surface, using an endless, rotating conveyor band, one end of which being immersed in the liquid, and a collecting band, which is running from a supply down into the liquid and, resting on the conveyor band, up from the liquid, carrying with it substances floating in the liquid surface to a collecting device, receiving the collecting band and the substances transported on said band. Thus, substances in the liquid surface are lifted up from underneath and removed out of the liquid by the collecting band.

Keywords: Pollutant, mechanical removal

U.S. Cl. X.R. 210-401; 210-DIG.21



3,817,662

**WAVE MOTOR**

Stephen Sterk, 3822 Apalachee Pkwy., Tallahassee, Fla. 32301

Filed Jan. 3, 1973, Ser. No. 320,830

Int. Cl. F04b 17/00, 35/00

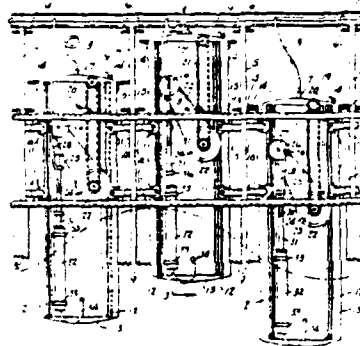
U.S. Cl. 417-333

10 Claims

A wave motor having at least one vertically and slideably supported air tank to be positioned in the ocean for floating up and down due to waves passing thereby and operating an air compressor with the compressed air therefrom being used as a source of energy.

Keywords: Power, wave; Pump

U.S. Cl. X.R. 60-22



3,818,440

**SEISMIC ENERGY GENERATOR FLOAT**

Clifford D. Dransfield, Dallas, Tex., assignor to Atlantic Richfield Company, Los Angeles, Calif.

Filed Dec. 8, 1972, Ser. No. 313,547

Int. Cl. H04b 13/02; B63b 21/56

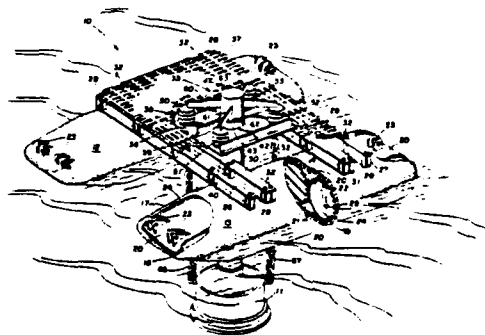
U.S. Cl. 340-8 S

11 Claims

A float for carrying a seismic energy generator includes two side-by-side float assemblies, each of two enclosed tubes tapered at their front ends to facilitate towing, and wrapped lengthwise with a fiberglass sheet. The edges of the sheet and exposed surfaces are filled and coated with a tough coat to present a smooth surface. The two float assemblies are interconnected with braces, which support a deck and a mounting platform from which the seismic energy generator is suspended.

Keywords: Seismic explosive acoustic transmitter; Towed vehicle

U.S. Cl. X.R. 114-235B; 340-3T; 340-17R



JUNE 25, 1974

3,818,524

DEEP-SEA SLACK WIRE MOORING SYSTEM

Bertrand J. Starkey, Saanichton, B. C., Canada, assignor to  
Hermes Electronics Limited, Dartmouth, Nova Scotia,  
Canada

Filed Jan. 22, 1973, Ser. No. 325,634

Claims priority, application Canada, July 4, 1972, 146263

Int. Cl. B63b 21/52

U.S. Cl. 9-8 R

10 Claims

Apparatus for use in slack line mooring systems, especially those having an "N" configuration, which is useful for mooring bodies floating in water of unknown depth and which includes an anchoring device adapted to descend to and rest on the floor of a body of water. A cable storage means is associated with the anchoring device for storing a length of cable and is adapted to pay out, upon deployment of the anchoring device, a length D of cable therefrom approximately equal to the vertical distance between the floor of the body of water on which the anchor is to rest and the surface of said water. Of fundamental importance to the apparatus is the provision of means, adapted to be preconditioned by the magnitude of said length D of cable paid out, for permitting said cable storage means to pay out an additional length X of cable so related to said length D that the "Scope" of the cable system as determined by the ratio of said lengths according to the formula  $(D + X/D)$  assumes a suitable value, whereby to permit said cable to assume a configuration, especially an N configuration, under slack cable conditions of such proportions as to minimize the possibility of damage thereto which might otherwise result from an excess or deficiency of slack in said cable.

Keywords: Buoy mooring system; Instrument deployment

U.S. Cl. X.R. 114-206R; 114-230



3,818,703

WAVE ENERGY CONVERTER ARRAY

James M. Lapeyre, New Orleans, La., assignor to The Laltram Corporation, New Orleans, La.

Continuation-in-part of Ser. No. 148,775, June 1, 1971,  
abandoned. This application June 25, 1973, Ser. No. 373,443

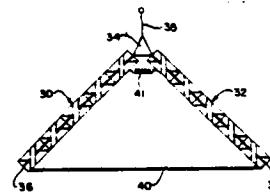
Int. Cl. F03c 5/02

U.S. Cl. 60-504

15 Claims

Apparatus for converting the energy of surface waves in a liquid such as an ocean, comprising an array of buoyant helical members each mounted for rotation about an axis. The pitch of the helical members equals or is greater than the length of the expected waves and the members are floated on the surface with their axes oriented so that wave length of the waves matches the pitch of the helices times the cosine of the angle between the helical axes and the direction of wave propagation. In one embodiment the array is a large chevron formed of two groups of helical members and is pivotable about the apex of the chevron. In another embodiment the helical members are arranged in zig-zag fashion. Means are provided for adjusting the angles between the arms of the chevron in the one case, and the adjacent arms of the zig-zag in the other case.

Keywords: Power, wave



3,818,704  
**APPARATUS FOR CONVERTING THE ENERGY OF  
 OCEAN WAVES**

James M. Lapeyre, New Orleans, La., assignor to The Laitram Corporation, New Orleans, La.

Filed June 25, 1973, Ser. No. 373,395

Int. Cl. F03c 5/02

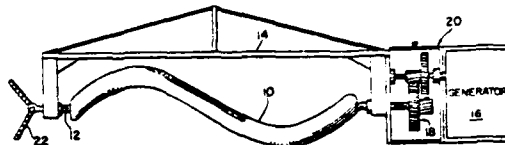
U.S. Cl. 60—504

16 Claims

Apparatus for converting the energy of surface waves in a liquid such as an ocean, comprising a buoyant helical member mounted for rotation about an axis. The pitch of the helical member approximates the length of the expected waves and the member is floated on the surface with its axis oriented so that each wave traverses the helix lengthwise and buoyantly supports successive sections thereof causing it to rotate about its axis. The helix is coupled with rotary driven means such as an electrical generator.

Keywords: Power, wave

U.S. Cl. X.R. 60-398



3,818,708  
**FLOATING BARRIER**

Robert A. Benson, Cohasset, Mass., assignor to Submarine Engineering Associates, Inc., Cohasset, Mass.

Filed Feb. 2, 1972, Ser. No. 222,867

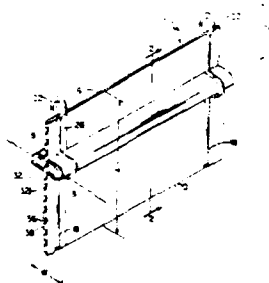
Int. Cl. E02b 15/04

U.S. Cl. 61—1 F

12 Claims

A floating barrier capable of permanently enclosing an area at sea is made up of sections each comprising a solid vertical dam with stiffening ribs and substantially continuous flotation extending laterally from opposite sides of the dam, the flotation preferably being foam filled tubes, adjacent sections of the barrier preferably being hinged to each other.

Keywords: Pollutant, surface barrier



3,819,514  
**OIL SPILL RECOVERY**

Bert H. Clappitt, Overland Park; Kenneth E. Harwell, Merriam, and Joseph W. Jones, Jr., Leawood, all of Kans., assignors to Gulf Research & Development Company, Pittsburgh, Pa.

Filed Sept. 24, 1971, Ser. No. 183,574

Int. Cl. B01d 15/00

U.S. Cl. 210—40

6 Claims

An article of manufacture for use in the removal and recovery of oil slicks or spills floating on the surfaces of bodies of water consisting essentially of a foam of an ethylene-alkyl acrylate copolymer having a melt index of at least 800, preferably an ethylene copolymer containing from about 10 up to about 45 weight percent methyl acrylate having a melt index in the range of from about 1,000 up to about 2,000 and a process for using such foams in the selective removal of oil from water surfaces and the recovery of the absorbed oils from said foams is disclosed.

Keywords: Pollutant absorption

U.S. Cl. X.R. 210-DIG.21

No Figure

JUNE 28, 1974

3,820,258  
APPARATUS AND METHOD FOR DREDGING,  
RETENTION, TRANSPORT AND DISPOSAL OF  
DREDGED MATERIAL

Willard F. Fahrner, 2905 Spring Park Rd., Jacksonville, Fla.  
32207

Filed Oct. 31, 1972, Ser. No. 302,543

Int. Cl. E02f 3/88; B63b 21/62; 35/28

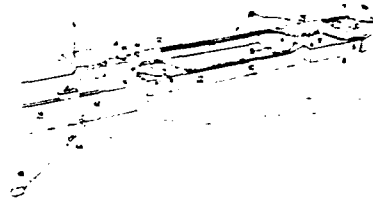
U.S. Cl. 37-58

7 Claims

A system of subaqueous excavation and material removal having the combination of a hopper dredging vessel, hopper barges with independent dumping capacity and a prime mover vessel such as a tug, each barge having a stern notch and a bow portion which is contoured to be received in a like stern notch of an adjacent barge so that two or more barges can be arranged in an assemblage, end-to-end with bow portions fitting into the stern notches. The dredging vessel and prime mover vessel also have like bow portions whereby they can connect into the assemblage. By transporting filled assemblages from the dredging vessel for dumping and replacing same by empty assemblages the dredging vessel may continue its operation on practically a 24 hour basis. Rapid and effective securing of the assemblage, the dredging vessel and prime mover vessel are obtained through pneumatic fenders attached to the sides of the stern notches and a pneumatically controlled cushioning fender couple attached to the stern which is received between vertical expansible fenders at the apex of the stern notch. By expansion of the fender couple and the apex fenders the vessel is effectively secured to the assemblage. In order to separate the assemblage and the vessel, the fender couple and the tubular members are deflated. Conduits to carry dredged material are located on each barge and the dredging vessel. Each has a tubular outlet extending proximate the bow portion which is received in a larger tubular inlet extending proximate the stern notch, there being an arrangement of annular members about the engaging conduit means which are expansible and securely connect the conduits together whereby dredged material may be delivered from the dredging vessel simultaneously to each of the barges in the assemblage. The connection of the units is accomplished without any rigid structural linkage over a relatively broad and large surface to surface area whereby unwanted redundancy of strength at the connection is largely eliminated.

Keywords: Dredge pipe; Dredge-spoil transport;  
Hopper barge

U.S. Cl. X.R. 37-72; 37-195; 114-26;  
114-235R; 141-237; 141-287; 141-387; 285-97



3,820,339  
ARTIFICIAL SEAWEED CUT FROM CONTINUOUS BAND  
Bartol Fernandez Luque, Rijswijk, Netherlands, assignor to  
Shell International Chemicals, New York, N.Y.

Filed Apr. 9, 1973, Ser. No. 349,363

and priority application Great Britain, Apr. 18, 1972,  
app. No. 10,000

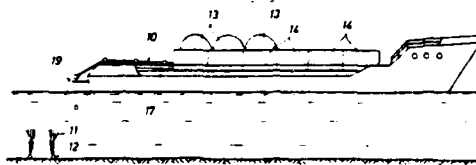
Int. Cl. E02b 3/04

7 Claims

The invention relates to a process for preparing artificial seaweed, in which the seaweed is to be dropped into a body of water, forming a continuous band of flexible, elongated material, the securing anchoring of the ends of the polymer band at intervals, and the cutting the band into individual pieces. The invention also in-  
cludes the process.

Keywords: Artificial seaweed

U.S. Cl. X.R. 61-72.1; 61-72.3; 114-.5R





3,820,343

**SELF-SUPPORTING WALL**

George J. Morren, Zeeland, and Neil R. Berndt, St. Joseph, both of Mich., assignors to Speidel Foundation & Marine, Inc., Benton Harbor, Mich.

Filed Mar. 28, 1973, Ser. No. 345,492

Int. Cl. E04b 1/344

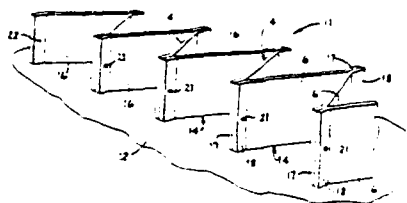
U.S. Cl. 61-35

12 Claims

A self-supporting wall construction comprising a plurality of V-shaped modules connected together to form a zig-zag shaped wall. Each module comprises a pair of wall segments which extend at an angle relative to one another and have their adjacent ends connected together. The pair of wall segments of each V-shaped module are connected by a substantially horizontal hinge, and the adjacent modules are similarly connected by horizontal hinges whereby the individual wall segments are permitted to vertically pivot relative to one another to conform to an unlevel supporting surface. This hinging movement also enables the individual wall segments to relatively move as required by the external loads imposed thereon.

Keywords: Breakwater, concrete; Groin; Low-cost shore protection; Seawall

U.S. Cl. X.R. 52-71; 52-584; 61-49



3,820,346

**FREE PISTON WATER HAMMER PILE DRIVING**

Serge S. Wisotsky, Sharon, Mass., assignor to Orb, Inc., Marion, Ohio

Continuation-in-part of Ser. No. 163,422, July 16, 1971, abandoned. This application June 30, 1972, Ser. No. 267,740

Int. Cl. E02d 7/28

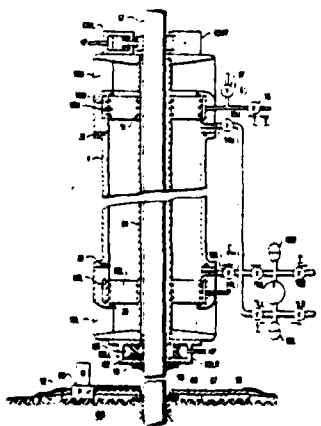
U.S. Cl. 61-53.5

6 Claims

Driving long piles into submerged lands with a liquid ram or spear generated in a free-piston evacuated tube. Various drivers are enclosed. In one embodiment, the pile itself is used as at least a portion of the working chamber for generating water hammer. In another, the working chamber is a tube separate from the pile.

Keywords: Offshore construction; Pile driver, impact

U.S. Cl. X.R. 173-1; 181-.5





**3,820,488**  
**UNDERWATER SEWAGE COLLECTION SYSTEM FOR DOCKED BOATS**  
 Harold E. Johnson, 5211 E. Ocean Blvd., Long Beach, Calif. 90803

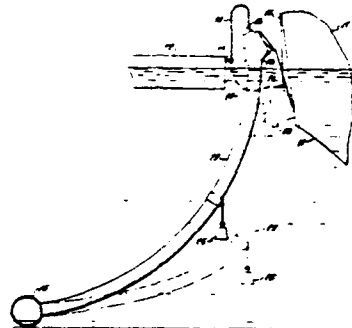
Filed Feb. 23, 1973, Ser. No. 335,434  
 Int. Cl. B63b 35/32

U.S. Cl. 114—.5 R 10 Claims

In an underwater sewage collection system for docked or moored boats or ships of the type including underwater collection means for receiving sewage and conduit means for conducting the sewage from the boat or ship to the sewage receiving means, there is disclosed an improvement comprising connector means for releasably connecting the conduit means to an underwater sewage outlet port of the boat or ship, such connector means being handled entirely from the inside of the boat or ship and the dock or other floating mooring alongside the boat.

Keywords: Pollutant collection; Small-craft service structure

U.S. Cl. X.R. 4-10; 137-236; 141-348



**3,820,495**  
**FENDER**  
 Shigeo Ueda, Yokohama, Japan, assignor to Bridgestone Tire Company Limited, Tokyo, Japan  
 Filed Feb. 7, 1973, Ser. No. 330,451

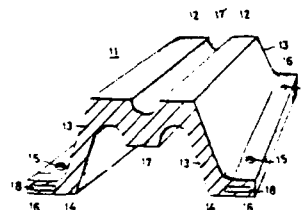
Claims priority, application Japan, Feb. 10, 1972, 47-16273  
 Int. Cl. B63b 59/02

U.S. Cl. 114—219 4 Claims

A fender adapted to be fixedly mounted on the surface of the quay or the like for elastically engaging with the broadside of a vessel which fender comprises a body made of elastic material such as natural or synthetic rubber substantially having a bottom wall to be contacted with the broadside and opposite side walls for forming a hollow space defined thereby with the quay surface, the inner surface of said top wall having an inwardly projected rib so that when the body is extensively collapsed said rib may abut on the quay surface to support the top wall together with said opposite walls for absorbing further shock energy. Due to such construction of the fender, a considerably wide range of the shock energy can be effectively absorbed.

Keywords: Pier fender

U.S. Cl. X.R. 61-48



**3,821,109**  
**METHOD FOR THE CONTROL OF OILS FLOATING ON WATER**

Ralph E. Gilchrist, and Jack C. Cox, both of Houston, Tex., assignors to Tenneco Oil Company, Houston, Tex.

Division of Ser. No. 183,620, Sept. 24, 1971, Pat. No. 3,755,189. This application Apr. 19, 1973, Ser. No. 352,529  
 Int. Cl. C02b 9/02

U.S. Cl. 210—36 6 Claims

The invention includes a method of controlling oil slicks on water by dispersing on the surface of the slick a composition of matter comprising a drying oil and a carrier for said drying oil. The carrier is of the type substantially nontoxic to marine life in the amounts employed and the composition is dispersed in an amount sufficient to confine the oil slick and allow removal thereof.

Keywords: Pollutant coalescence

U.S. Cl. X.R. 210-59; 210-DIG.21

No Figure

JULY 2, 1974

3,821,859  
DREDGE LADDER SHOCK MOUNTING  
ARRANGEMENTS

William Andrew McWatters, c/o P. E. Terry, Charlton Rd.,  
East Brookfield, Mass. 01515

Filed Nov. 4, 1971, Ser. No. 195,674

Int. Cl. E02f 3/90

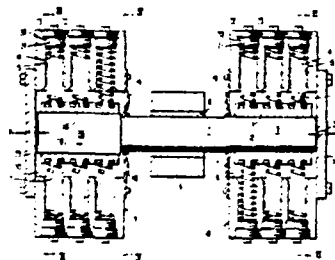
U.S. Cl. 37-67

54 Claims

Keywords: Dredge, cutterhead; Dredge ladder  
control

U.S. Cl. X.R. 37-72; 37-73; 74-18; 248-15;  
267-136; 287-86; 308-26

Shock mounting arrangements for mounting one end of a rigid dredge ladder and for mounting the holding spud on a dredging barge or dredging platform. In the ladder mounting, pivot pins are connected to one end of the ladder for permitting pivotal movement of the ladder thereabout. The pivot pins are supported in rigid housing structures attached to the barge structure. These housing structures include a plurality of coil springs operatively engaging the pins and the rigid housing structure such that the pins are normally held in a fixed position but are permitted limited radial movement in response to dredging operation shock forces transmitted by way of the ladder to the pin means. Guide means can also be provided to limit the motion of the pin means along a single plane extending perpendicularly to the pivot axis of the ladder. Other shock absorbing means, such as hydraulic means or rubber means can be substituted for the spring means. One arrangement of the invention provides for mounting the dredge ladder for pivoting movement about an axis at the rear of the barge, while another embodiment provides for pivotally mounting the ladder forwardly of the rear of the barge. In the holding spud mounting, a vertically extending housing is provided with radially extending springs for supporting the holding spud in vertical position with respect to the barge. These springs permit limited radial movement to attenuate shifting shock forces caused by winds and water swells.



JULY 9, 1974

3,822,555  
MARINA PROTECTIVE WAVE BREAKER

L. C. Strawn, P.O. Box 1145, and Vernon W. Stanton, Sr.,

P.O. Box 693, both of Tucuman, N. Mex. 88401

Filed Mar. 12, 1973, Ser. No. 340,098

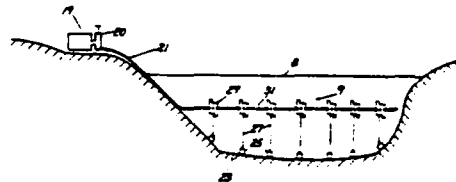
Int. Cl. E02b 3/04

U.S. Cl. 61-6

7 Claims

Keywords: Breakwater, pneumatic

A simplified air burst wave breaker for the protection against wave action of Marina installations and the like. The air burst unit comprises a duct in the form of two vertical U portions arranged with their openings toward each other, having a common leg and in which at least the bottom free leg is longer than the common leg. The lower free leg provides a water inlet stem and the upper free leg provides the air burst or burp outlet stem. The U portion open at the bottom an air inlet connection in the upper bend thereof.



3,822,557

# JET SHEET AND CIRCULAR PILE WITH WATER HAMMER ASSIST

Leonard L. Frederick, 15 Crestview Ter., Whippany, N.J. 07981

Filed Sept. 29, 1972, Ser. No. 293,444

Int. Cl. E02d 5:00, 5:04

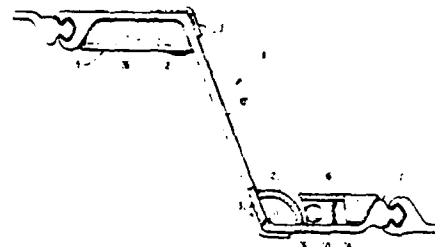
U.S. Cl. 61-53

15 Claims

The invention relates to a system of furnishing a supply of lubricant to the opposed sides of a section of piling and a movable drive shoe carried thereby to facilitate the driving of the piling in any type of earthen strata.

Keywords: Pile driver, vibratory; Pile driver, water jet; Pile-driving shoe; Pile, sheet; Pile, steel

U.S. Cl. X.R. 61-53.S; 61-53.74



3,822,558

# ARCTIC DREDGING AND PIPELAYING

Owen D. Blankenship, Houston, Tex., assignor to Global Marine Inc., Los Angeles, Calif.

Filed July 28, 1972, Ser. No. 276,110

Int. Cl. F16I 1:00; B63b 35:04

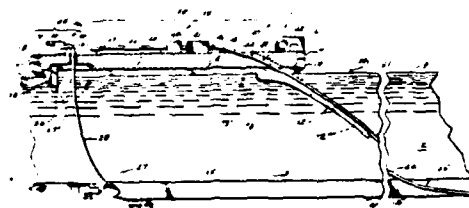
U.S. Cl. 61-72.1

11 Claims

Apparatus for arctic dredging and marine pipelaying during ice-free and iced conditions is described. For dredging, a dredging facility is carried on a buoyant platform which is

Keywords: Dredge propulsion; Ice protection; Seabed pipeline placement; Seabed trencher

U.S. Cl. X.R. 37-54; 37-64; 61-72.3; 61-72.4; 180-116



adapted for support on a cushion of air. The dredging facility includes a dredging head which is operable, when engaged with the bed of a body of water to be dredged, for removing material from the bed. A dredgings conductor tube is connectible between the dredging head and the platform for conducting dredged material from the head to the platform. The dredging equipment also includes means carried by the platform for forming a channel through a layer of ice below the platform for passage of the conductor tube through the ice when the dredging apparatus is operated during iced conditions.

The pipelaying equipment includes a pipelaying facility carried by a buoyant platform, which is adapted for support on a cushion of air. The pipelaying equipment includes means carried by the platform operable for forming through an ice layer below the platform a channel through which pipe may be laid from the platform to the bed of the body of water across which the pipeline is to be laid. The portion of the pipeline which extends between the platform and the bed of the body of water is supported along at least a portion of its length adjacent the pipelaying platform. This support of the pipeline may be provided by a stinger assembly coupled to the platform with its upper end disposed within the area of air cushion support of the platform.

The dredging apparatus and the pipelaying apparatus may be provided on a common buoyant platform adapted for support on a cushion of air. In such case, the dredging facility is located on the platform forward of the pipelaying facility so that, during pipelaying operations through ice, pipe is laid through the channel formed in the ice for the dredgings conductor tube.

3,822,789

# OIL SKIMMER MODULE WITH FREE FLOATING WEIR TROUGH

Angelo J. Crisafulli, Box 1051, Glendive, Mont. 59330  
Continuation-in-part of Ser. No. 142,282, May 11, 1971, Pat.  
No. 3,756,414. This application Feb. 6, 1973, Ser. No. 330,079  
Int. Cl. E02b 15/04

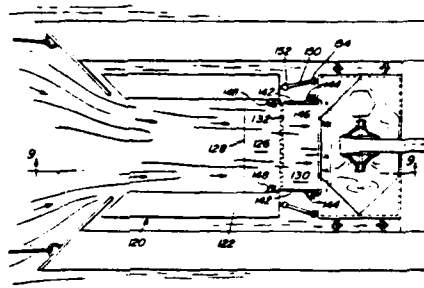
U.S. Cl. 210-242

3 Claims

A skimmer for removal of a layer of oil or other floating pollutants from the surface of a body of water incorporating a sump box having a pump disposed therein for conveying material from the sump box into a floating barge, vessel or other area. A free floating weir forming means is disposed forwardly of the sump box and connected and communicated therewith in such a manner that the weir forming means may vary in elevational relation to the sump box without the sump box being elevationally varied in relation to the surface of the water. The weir forming means is supported by float means which orients the weir of the weir forming means in desired relationship to the surface of the water.

Keywords: Pollutant collection; Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.21



JULY 16, 1974

3,823,495

# ROTATABLY DRIVEN CUTTER FOR A SUCTION DREDGER

Carl David Robertson, Akersloot, Netherlands, assignor to  
N.V. Industriele Handelscombinatie Rotterdam, Netherlands

Filed Feb. 1, 1973, Ser. No. 328,604

Claims priority, application Netherlands, Feb. 4, 1972,  
7201500

Int. Cl. E02f 3/92

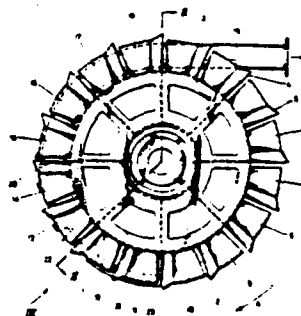
U.S. Cl. 37-66

4 Claims

A rotatably driven cutter for a suction dredger has a rotatable member with two series of axially spaced scoop-shaped cutters disposed in parallel planes and carried by the rotatable member. The suction tube of the dredger extends over the shaft of the rotatable member and terminates downwardly at about the level of the rotation axis of the member and is extended by a guide plate that continues peripherally between the outer ends of the cutters and terminates below the shaft of the rotatable member. The rotatable member rotates in a direction such that the scoops first encounter the guide plate so that the dredged solids are confined laterally between the cutters and radially between the rotatable member and the guide plate, and then are carried in the direction of rotation toward the mouth of the suction tube.

Keywords: Dredge, cutterhead; Dredge intake

U.S. Cl. X.R. 37-70; 37-189



3.823.563

**SPUD TANK FOR OFFSHORE DRILLING UNIT**

Peter M. Lovie, Houston, Tex., assignor to Engineering Technology Analysts, Inc., Houston, Tex.

Filed Sept. 5, 1972, Ser. No. 286,162

Int. Cl. E02b 17/00; E02d 5/72

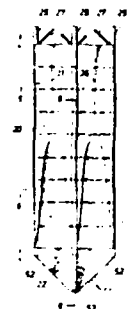
U.S. Cl. 61-46.5

20 Claims

A spud tank for attachment to at least one of the legs of an offshore drilling unit having a work platform and a plurality of legs depending therefrom for supporting the drilling unit on the floor of a body of water. The spud tank may comprise an elongated body section and a tip section depending downwardly from the body section. The uppermost portion of the body section may be provided with a polygonal cross section, the lowermost portion having a substantially star-shaped cross section of a relatively smaller area. The sides of the polygonal cross section may be connected to the sides of the star-shaped cross section by nonplanar walls. The tip section may comprise a plurality of radial blade members, the outer edges of which are tapered downwardly and inwardly from the points of the star-shaped body cross section, converging together in a pointed tip.

Keywords: Offshore platform, jack up; Offshore platform, leg; Seabed foundation

U.S. Cl. X.R. 37-73; 61-53



3.823.828

**PROPELLING ARRANGEMENT FOR OIL AND GARBAGE SKIMMER CRAFT**

Abram Yakovlevich Derzhavets, prospekt Gagarina, 4, kv. 5; Petr Grigorievich Kogan, ulitsa Perekopskoi divizii 2, kv. 14; Vladimir Nikolaevich Semenov, ulitsa Varnenskaya, 19, korpus 8, kv. 29, and Viktor Iosifovich Tabachnikov, ulitsa Varnenskaya 19, korpus 8, kv. 31, all of Odessa, U.S.S.R.

Filed May 8, 1973, Ser. No. 358,360

Int. Cl. B01d 35/02

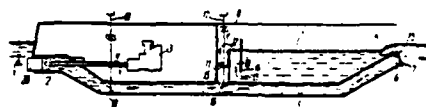
U.S. Cl. 210-242

5 Claims

A propelling arrangement for self-propelled oil and garbage skimmer craft having a collecting receptacle, comprises a water jet and a duct for taking in water and delivering it to the water jet. The intake hole of the duct is located below the means for water inflow to the collecting receptacle of the skimmer craft, due to which a water stream entering the duct draws in the upper layer of water together with floating impurities towards the means for water inflow to the collecting receptacle.

Keywords: Pollutant collection; Pollutant removal watercraft

U.S. Cl. X.R. 210-83; 210-DIG.21



JULY 23, 1974

3,824,794

**OFFSHORE MARINE ANCHORING STRUCTURE**

Laurence M. Hubby, Bellaire, Tex., assignor to Texaco Inc., New York, N.Y.

Division of Ser. No. 143,074, May 13, 1971, Pat. No. 3,745,776. This application Nov. 29, 1972, Ser. No. 310,632  
Int. Cl. E02d 5100, 5140, 2732

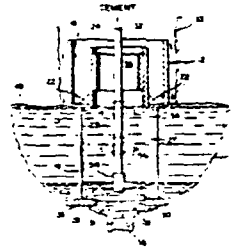
U.S. Cl. 61-46

3 Claims

An apparatus for achieving the anchoring of an offshore marine platform having downwardly extending foundation legs. One or more legs are provided with a reinforcing cage at the lower end thereof adapted to be immersed in a cement anchoring block whereby to firmly position the platform.

Keywords: Embedment anchor; Offshore platform anchor; Offshore platform, leg

U.S. Cl. X.R. 61-50; 61-53.52; 61-53.6



3,824,795

**PLATFORM STRUCTURE**

Olav Mo, Grønsundveien 94, Nesbru, 1370-Asker, Norway  
Filed Mar. 8, 1972, Ser. No. 232,665

Claims priority, application Norway, Sept. 7, 1971, 3325/71; Mar. 16, 1971, 3326/71; Nov. 19, 1971, 4282/71  
Int. Cl. E02d 1700, 2738

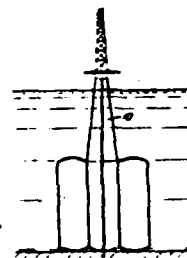
U.S. Cl. 61-46.5

10 Claims

An offshore drilling platform includes a massive and heavy caisson surmounted by a lightweight superstructure. The center of buoyancy is above the center of gravity of the platform and the platform can be floated in upright position to a desired location and sunk by introducing ballast, such as sea water, into the caisson. The platform rests on the sea floor and is stable due to its own weight while the lightweight superstructure extends above the sea surface. A drilling platform is provided in fixed position on the superstructure above sea level.

Keywords: Offshore caisson; Offshore platform, fixed; Seabed foundation

U.S. Cl. X.R. 220-18





3,824,796

**MOBILE DOCK STRUCTURE**

Charles L. Nasby, Jr., 4624 Bruce Ave. So., Minneapolis, Minn. 55424

Filed Nov. 3, 1972, Ser. No. 303,606

Int. Cl. E02b 3/20

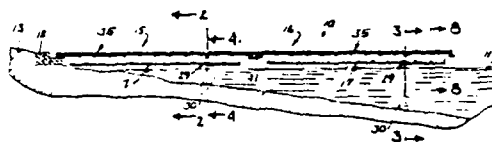
U.S. Cl. 61-48

6 Claims

A pair of longitudinally extended bar joists connected together in a generally parallel relationship have a wheel-equipped frame mounted spaced from one end thereof for adjustment of the wheels toward and away from the bar joists. A plurality of deck members are secured to the bar joists by nut-equipped bolts which pass through the deck members and selected ones of a plurality of longitudinally extended slots formed in each of the bar joists at spaced intervals longitudinally of the bar joists.

Keywords: Pier, fixed; Pier, mobile; Small-craft pier

U.S. Cl. X.R. 52-694



3,824,797

**EVACUATED TUBE WATER HAMMER PILE DRIVING**

Serge S. Wisotsky, Sharon, Mass., assignor to Orb, Inc., Marion, Ohio

Continuation-in-part of Ser. No. 163,422, July 16, 1971, abandoned. This application June 30, 1972, Ser. No. 267,753

Int. Cl. E02d 7/10; G01v 1/38

U.S. Cl. 61-53.5

34 Claims

Driving long piles into submerged lands with a liquid ram or spear generated in an evacuated tube. Various drivers are enclosed. In one embodiment, the pile itself is used as at least a portion of the working chamber for generating water hammer.

Keywords: Offshore construction; Pile driver, impact; Power, submerged source

U.S. Cl. X.R. 173-1; 175-56; 181-.5H



3,824,798

# SUBMARINE CABLE-BURYING DEVICES

Katsuke Shirokuma, Yokohama, and Takeo Yokoyama, Kamakura, both of Japan, assignors to The Furukawa Company Limited, Tokyo, Japan

Filed June 7, 1972, Ser. No. 260,430

Claims priority, application Japan, Nov. 15, 1971, 46-90661; Nov. 15, 1971, 46-90662; May 8, 1972, 47-53340

Int. Cl. E02f 5/02; F16l 1/00

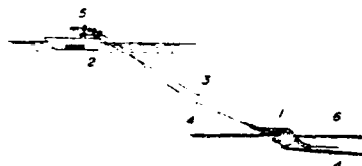
U.S. Cl. 61-72.4

8 Claims

A plow-type cable-burying device for use in placing communication and power transmission cables under ground under a body of water has a protective blade, cultivating blades and a plow-type digging blade arranged in succession in the order as mentioned along a tubular body for guiding a cable to be buried in the ground under water. The tubular body is stabilized by sledges and the cable is further guided by a plurality of cable guide cylinders.

Keywords: Seabed cable plow

U.S. Cl. X.R. 61-72.6



3,824,852

# ELECTRICALLY POWERED SUBMERGED PUMP, POWER CIRCUIT THEREFOR, AND OCEANOGRAPHIC MONITORING APPARATUS AND METHOD EMPLOYING SAME

Carl L. Otto, Lummi Island, Wash. 98262

Filed Feb. 17, 1972, Ser. No. 227,075

Int. Cl. G01d 21/00; B63b 59/00; F04b 17/04

U.S. Cl. 73-170 A

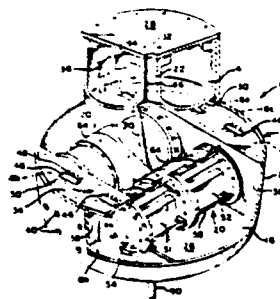
43 Claims

A submerged unit adapted to monitor water conditions several miles from shore, with a housing having a float chamber, a water monitoring section and plurality of reciprocating pumps to move ambient water through the monitoring section. Solenoid type units drive the pumps to move sample water past sensors in the monitoring section and provide inertial masses to vibrate the entire unit both laterally and rotationally to minimize attachment of marine organisms thereto. The power units also provide a constant flushing of screened inlet openings through which the sample water passes so as to prevent clogging thereof by marine organisms or debris.

The two power units oscillate 90° out of phase through two sets of two solenoids, one set for each power unit. This is accomplished by circuitry distributing successive half waves of an alternating current supply to the solenoids in sequence. Each solenoid is energized through an electronic valve receiving gated power through another solenoid, the gating being through a capacitor and diode whereby the capacitor is initially rapidly charged and then discharged slowly enough to prevent or block regating until occurrence of a subsequent half wave, the blocking action being reinforced by the voltage drop occurring across the other solenoid, which in the meanwhile has been preferentially gated.

Keywords: Fouling prevention; Pump; Sampler, water

U.S. Cl. X.R. 21-54; 21-102; 43-124; 134-1; 417-61; 417-62; 417-211



3,824,942

# OFFSHORE UNDERWATER STORAGE TANK

Donald Claude Stafford, Hinsdale; Gerald Edward Burns, Villa Park, and Kerry Charles McKenna, Oak Brook, all of Ill., assignors to Chicago Bridge & Iron Company, Oak Brook, Ill.

Filed Jan. 17, 1972, Ser. No. 218,357

Int. Cl. B63b 35/44

U.S. Cl. 114—0.5 T

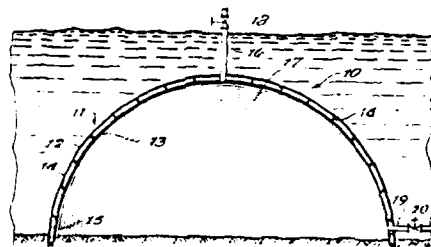
1 Claim

An offshore storage tank, to be placed on a sea floor, having a dome-shaped rigid continuous enclosure, open at the bottom, a buoyant chamber in the enclosure extending over a large part of the area of the enclosure and positioned and sized to provide buoyancy balance or equilibrium to the tank when the tank is floating on water with or without any amount of air in the large volume defined by the enclosure, a conduit to remove air from beneath the enclosure to lower it in water.

The enclosure can constitute two spaced apart rigid domed shells with rigid connecting members joined to each shell to hold them in fixed position relative to each other, with a concrete ring closing the bottom of the enclosure between the shell ends thus defining a hollow enclosed space between the shells.

Keywords: Offshore storage tank, submerged

U.S. Cl. X.R. 61-46



JULY 30, 1974

3,826,098

# METHOD AND MEANS FOR REDUCING WAVE PRESSURES ON UNDERSEA CONSTRUCTIONS

Jan Larsen, Marknadsvagen 61, Taby, Sweden

Filed Sept. 25, 1972, Ser. No. 291,817

Claims priority, application Sweden, Oct. 12, 1971, 12921/71

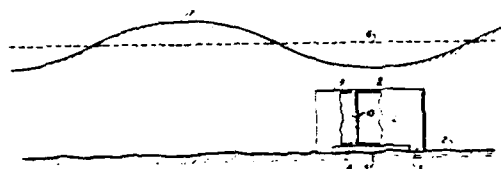
Int. Cl. E02d 29/00

U.S. Cl. 61—46

8 Claims

A method and device for reducing lifting forces, on an undersea construction, resting on the bottom of the sea. Such lifting forces are caused by passing wave troughs which create more significant low pressures on the upper side of the construction than those low pressures at the bottom of the sea. The invention effects a pressure equalization between said two low pressure areas. Such a pressure equalization can be achieved by placing the area below the bottom of the construction in open communication with the area above the construction.

Keywords: Offshore storage tank, submerged; Seabed foundation



3,826,099  
SELF-ELEVATING OFFSHORE PLATFORM WITH  
FOLDING LEGS

Peter M. Lovie, Houston, Tex., assignor to Engineering  
Technology Analysts, Inc., Houston, Tex.  
Filed Sept. 25, 1972, Ser. No. 291,780  
Int. Cl. E02b 17/00

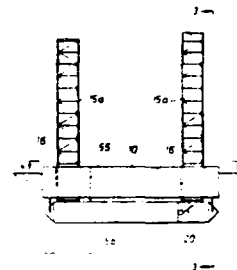
U.S. Cl. 61-46.5

17 Claims

An offshore drilling unit of the self elevating platform type having a floating hull and plurality of legs movable from a raised position, in which the legs are supported by the floating hull, to a lowered position engaging the floor of a body of water, in which the hull is supported on the legs. The legs are of articulated construction permitting a first portion of each leg, when in the raised position, to swing from longitudinal alignment with a second portion of the leg to horizontal alignment underneath the hull for carriage during water travel. Ballast means including tanks in the first portion of leg may be provided for moving the first leg portion between the longitudinally aligned position and the horizontal position underneath the hull. The first portion of the leg may be attached to the second portion by a pivot arrangement and disengageable fastening assembly.

Keywords: Offshore platform, jack up; Offshore platform, leg

U.S. Cl. X.R. 37-73; 114-0.5



AUGUST 6, 1974

3,827,290  
STREAM TABLE STUDY CENTER  
Arthur W. Carlson, Muskegon, Mich., assignor to E. H. Shel-  
don and Company, Muskegon, Mich.  
Filed Mar. 6, 1973, Ser. No. 338,505  
Int. Cl. G01m 10/00

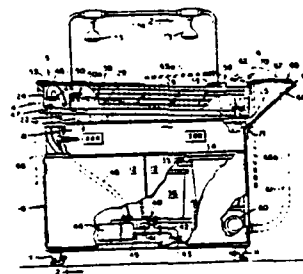
U.S. Cl. 73-86

7 Claims

A portable stream table for simulating the effect of waves  
on a land mass and for measuring and recording the resulting  
erosion of the land mass.

Keywords: Hydraulic model basin; Wave  
generator

U.S. Cl. X.R. 73-148; 73-432SD



AUGUST 13, 1974

3,828,380

**FIXED FREEBOARD SPAR BUOY**

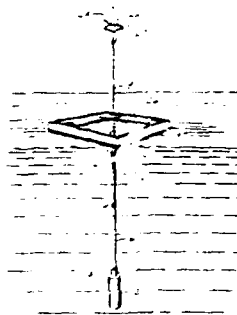
Morris Lebovitz, and James C. Schaff, both of San Diego, Calif., assignors to Global Marine Inc., Los Angeles, Calif.  
Filed Mar. 8, 1973, Ser. No. 339,414  
Int. Cl. B63b 27/52

Keywords: Buoy, instrumented

U.S. Cl. 9-8 R

4 Claims

There is described an instrumentation buoy having an elongated vertical spar, the upper end of which has a collar to which is tied by a group of slack flexible lines, an annular float which surrounds the upper end of the spar. The flexible attachment between the float and the spar isolates pitch and roll motions of the float from the spar while providing coupling to vertical heave.



3,828,451

**DUCTING SYSTEM FOR SUCTION DREDGERS HAVING PIVOTALLY CONNECTED TUBE LENGTHS**

Jan de Koning, Amsterdam; Romke van der Veen, Jutphaas, and Tjako Aaldrik Wolters, Vianen, all of Netherlands, assignors to Ballast-Nedam Groep N.V., Amsterdam, Netherlands

Keywords: Dredge, suction; Dredge pipe

U.S. Cl. X.R. 37-72; 137-615; 285-114; 285-227

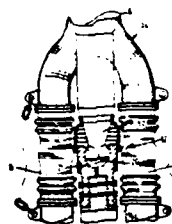
Filed Jan. 29, 1973, Ser. No. 327,408  
Claims priority, application Netherlands, Jan. 28, 1972, 7201145

Int. Cl. E02F 3/90

U.S. Cl. 37-58

6 Claims

An earth dredger comprising a duct system for sucking up earth from a soil below water, the duct system comprising a plurality of rigid lengths of tube pivotally connected with each other by means of universal joints formed by hinge parts and coupling members and communicating with each other through flexible, elastic bellows is improved in that the coupling members of the universal joints are arranged between two adjacent bellows, so that the universal joint has smaller dimensions and the earth dredger is less expensive.



COASTAL ENGINEERING RESEARCH CENTER FORT BELVOIR VA F/8 13/2  
AN ANNOTATED BIBLIOGRAPHY OF PATENTS RELATED TO COASTAL ENGINE--ETC(U)  
NOV 79 R E RAY, M D DICKEY, A M LYLES  
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3,828,557

**ELECTRIC GENERATING APPARATUS CONVERTING  
THE PUSHING ACTION OF WAVES INTO ELECTRICAL  
POWER**

Ashton Mochel, Houston, Tex., assignor to Ocean Power  
Generation, Inc., Houston, Tex.

Filed Jan. 17, 1973, Ser. No. 324,563

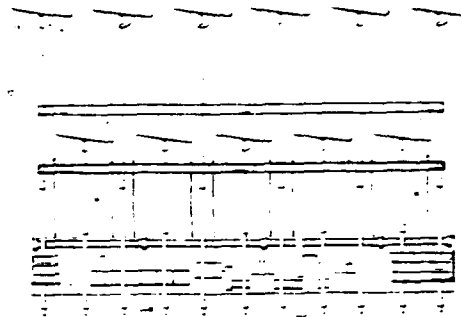
Int. Cl. F03g 7/00

U.S. Cl. 60—503

29 Claims

An apparatus which forms electrical power from the pushing action of waves wherein the waves are intercepted by a boom mounted tee head which incorporates a metal framework supporting a number of shutters, the shutters intercepting the forward motion of a wave but being alternately released to hinge or pivot so as to make the tee head transparent to wave action on return to an extended position on said boom, said booms supported by an onshore structure which includes a drive shaft extending along the shoreline, the drive shaft being rotated by a plurality of such booms, and the drive shaft being extended to a substantial flywheel which is connected to an electric generator. All of the apparatus is mounted on a carriage which moves up and down the shore. The booms are rotated about an axis to raise and lower the tee head to accommodate variations in wave action, tide, seasons of the year and the like.

Keywords: Electrical generator; Power, wave



3,828,561

**DRILLING PLATFORM**

William H. Moore; George T. Richardson, and Floyd T. Pease,  
all of Houston, Tex., assignors to The Offshore Company,  
Houston, Tex.

Continuation of Ser. No. 202,350, Nov. 26, 1971, abandoned,  
which is a division of Ser. No. 819,623, April 28, 1969, Pat.  
No. 3,628,336. This application June 8, 1973, Ser. No.

368,236

Int. Cl. E02b 17/00; F16l 37/14; F16b 12/40

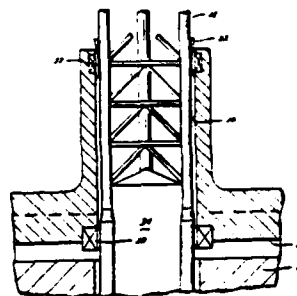
U.S. Cl. 61—46.5

3 Claims

A floating vessel suitable as a drilling platform in which the vessel has legs extending therethrough which in their upper position are tightly held by the vessel and each leg includes a footing which can be secured thereto or to the vessel when the legs are lowered to raise the vessel into operating position to provide the lower end of the legs with an extended bearing surface for engagement with the bottom.

Keywords: Offshore platform, jack up; Offshore  
platform, leg

U.S. Cl. X.R. 285-18; 285-141; 285-403;  
403-362; 403-306



3,828,563

**METHOD AND APPARATUS FOR TIGHTENING THE  
WATER-SUBMERGED JOINTS BETWEEN WALL-  
FORMING ELEMENTS**

Heinz Saucke, Hamburg, Germany, assignor to Weill &  
Reineke GmbH, Hamburg, Germany

Filed Aug. 8, 1972, Ser. No. 278,875

Claims priority, application Germany, Aug. 11, 1971,  
2140250

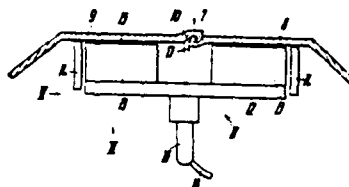
Int. Cl. E02d 5/00

U.S. Cl. 61-60

5 Claims

A method and apparatus for tightening the water sub-  
merged joints between wall forming elements, particularly the  
interlocking joints of steel sheet piling, characterized by the  
use of a compound to be injected into the joint and curing in-  
side said joint to an elastic body but under the pressure against  
which the tightening has to be effected into a sufficiently sta-  
ble body.

Keywords: Pile section connection; Pile,  
sheet; Pile, steel



3,828,565

**OFFSHORE LIQUID STORAGE FACILITY**

John Stanton McCabe, Naperville, Ill., assignor to Chicago  
Bridge & Iron Company, Oak Brook, Ill.

Continuation-in-part of Ser. No. 333,218, Feb. 16, 1973,  
abandoned. This application Sept. 28, 1973, Ser. No. 401,858

Int. Cl. F17c 1/02

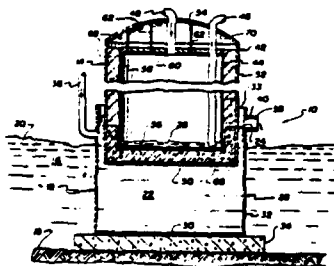
U.S. Cl. 62-45

11 Claims

An offshore liquid storage facility includes a receiver tank  
having an open top and being mountable on the sea floor with  
its top above sea level, means for maintaining water or other  
liquid in the receiver tank at a predetermined level above sea  
level, a liquid storage tank received in the receiver tank and  
movable telescopically up and down therein, and means for al-  
ternately supplying a liquid to the storage tank for storage  
therein and withdrawing the liquid therefrom, whereby the  
storage tank is held captive in the receiver tank while water or  
other liquid may be maintained in the receiver tank at the  
predetermined level for stabilizing the facility, and variations  
in buoyancy during liquid withdrawal and supply are accom-  
modated by up and down gravity movement of the storage  
tank in the liquid maintained in the receiver tank.

Keywords: Offshore storage tank, emergent

U.S. Cl. X.R. 61-46.5; 114-0.5T; 220-9LG;  
220-13; 220-26R





3,828,715

**AIR CUSHION TYPE FENDER FOR USE WITH A QUAY-WALL**

Kazuo Matsushita, Hiratsuka, Japan, assignor to The Yokohama Rubber Co., Ltd., Tokyo, Japan

Filed Feb. 12, 1973, Ser. No. 331,566

Claims priority, application Japan, June 23, 1972, 47-74117

Int. Cl. B63b 51/02, E02b 3/22

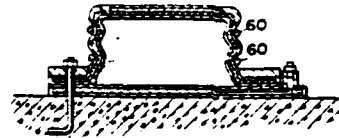
U.S. Cl. 114-219

8 Claims

An air cushion type fender for use at a quay-wall is provided having a hat-shaped body made of a rubbery resilient material and a bottom plate adapted to seal and close the bottom opening of the hat-shaped body which is filled with pressurized air. The hat-shaped body has a flange extending outwardly from the edge of its bottom opening, permitting mounting on the quay-wall by anchor bolts. This fender provides excellent damping of the initial impact at the instant of first contact of a vessel moored parallel to or at an angle with the quay-wall, by slipping and restoring to its original shape.

Keywords: Pier fender

U.S. Cl. X.R. 61-48



3,828,864

**PILE DRIVER AND EXTRACTOR**

Edwin Haverkamp, Grandville, and George J. Morren, Zeeland, both of Mich., assignors to H & M Vibro, Inc., Grandville, Mich.

Filed Feb. 26, 1973, Ser. No. 335,443

Int. Cl. E02d 7/06, 7/18

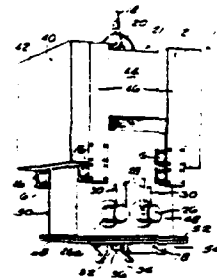
U.S. Cl. 173-49

17 Claims

First and second support frames are detachably interconnected to each other by rubber torsion discs which permit resilient damping movement between the two frames. A bias weight is attached to the first frame and an eccentric weight is rotatably mounted to the second frame and driven by a hydraulic motor to develop vibratory motion. The second frame also includes first and second jaws for clamping the piling therebetween. The device is cable suspended by a crane attached to the first frame and is insulated from the vibratory motion by the torsion discs. Preferably, two eccentric weights are driven about separate shafts in counter-relative rotation synchronized out of phase to exert uniaxial vibratory force on the piling while cancelling lateral forces.

Keywords: Pile driver, vibratory; Pile extractor

U.S. Cl. X.R. 61-53.5; 173-112; 173-162



3,828,866

# IMPULSE DRIVING APPARATUS

Joost Werner Jansz, The Hague, Netherlands, assignor to Hollandse Beton Groep N.V., Rijswijk Z.h., Netherlands  
Filed Aug. 14, 1972, Ser. No. 280,412

Claims priority, application Great Britain, Sept. 9, 1971, 42192/71

Int. Cl. E02d 7/10

U.S. Cl. 173-101

7 Claims

An impulse driving apparatus, for use for example in pile driving, in which a plurality of striker members are released from a given height above an object to which impulses are to be given in such a way that the striker members deliver impulses to the object either simultaneously or at pre-determined intervals of time.

Keywords: Pile driver, impact

U.S. Cl. X.R. 173-1; 173-DIG.1



3,828,886

# GEOPHYSICAL EXPLORATION APPARATUS

William P. Holloway, deceased, late of Austin, Tex. (by Frances F. Holloway, executrix)

Continuation-in-part of Ser. No. 354,358, Sept. 3, 1964, abandoned, and a continuation-in-part of Ser. No. 504,529, Oct. 24, 1965, abandoned, and a continuation-in-part of Ser. No. 552,668, May 2, 1966, abandoned, and a continuation-in-part of Ser. No. 842,814, July 7, 1969, Pat. No. 3,623,570.

This application Nov. 29, 1971, Ser. No. 202,889

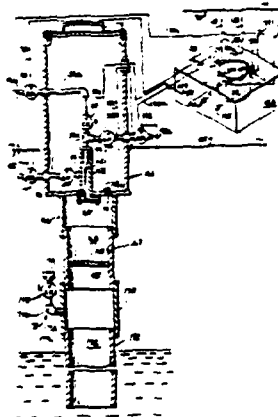
Int. Cl. G01v 1/00

U.S. Cl. 181-5 NC

7 Claims

The disclosure is to geophysical exploration apparatus most importantly directed to apparatus comprising a detonator providing an upper chamber into which a fuel and a combustion supporting gas together may be admitted, an ignition means being provided to ignite the mixture in the upper chamber, the explosion or combustion products being urged through restriction means provided between the upper chamber and a lower chamber, which has at least its lower end under water at the time of ignition and combustion. As the products of combustion are first urged through the restriction or escape passage means into the lower chamber to expand and pass downwardly through the water in and/or below the lower chamber, a check valve provided to communicate with the interior of the lower chamber below the escape passage or restriction means first remains closed to open as the pressure falls to permit air to be drawn into the lower chamber so that vacuum does not result therein following the blast. A means is also provided to admit a purge gas into the upper chamber to purge any residual products of combustion downwardly through the escape passage or restriction means.

Keywords: Seismic explosive acoustic transmitter



AUGUST 20, 1974

3,830,066

**APPARATUS AND SYSTEM FOR PRODUCING AND  
PROTECTING DEPOSITS OF SEDIMENTARY MATERIAL  
ON FLOORS OF BODIES OF WATER**

Ole Fjord Larsen, Auroravej 32A, Rodovre, Copenhagen,  
Denmark

Continuation of Ser. No. 667,954, Sept. 15, 1967, abandoned.

This application Apr. 13, 1971, Ser. No. 133,720

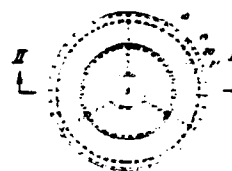
Int. Cl. E02b 3/04

U.S. Cl. 61-3

1 Claim

This disclosure relates to apparatus for producing and protecting deposits of sedimentary material on a floor of a body of water, the apparatus including a flexible sheet located beneath the surface of the water in at least partially upwardly spaced relationship close to but above the floor, and means for maintaining the flexible sheet so positioned. In its more specific aspects the sheet may be disposed either planar to the floor or arched concavely facing the floor and is preferably formed of mesh-like material having an edge entirely above or in contact with the floor and being supported from beneath and anchored in position.

Keywords: Bar protection; Fabric mat



3,830,068

**SYSTEM FOR EARTH PENETRATION IN DEEP WATER  
AT ATMOSPHERIC PRESSURE**

Philip W. Peter, 123 San Diego, San Clemente, Calif. 92672

Continuation of Ser. No. 19,012, March 12, 1970, abandoned.

This application Mar. 8, 1972, Ser. No. 232,957

Int. Cl. E02b 1/00, 17/00

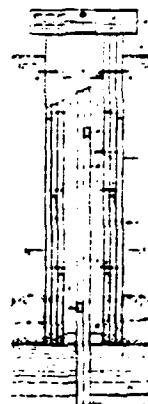
U.S. Cl. 61-34

9 Claims

The system enables underwater mining or other earth penetration to be conducted at atmospheric pressure in deep water through a hollow cylindrical entry column formed of concentric, radially spaced, cylindrical tubes extending from above water into the bottom and containing in the spaces therebetween water columns of progressively decreasing depth toward the center for offsetting the static pressure of the surrounding water. Constructible in situ, the column serves as a monopod adapted to support above water a platform on which any suitable structure can be mounted. The column is stabilized against dynamic lateral forces by jets, anchors or other counteracting devices and is removable for salvage or reuse elsewhere on completion of a particular operation.

Keywords: Offshore caisson; Offshore platform, fixed

U.S. Cl. X.R. 61-46; 61-46.5



3,830,071

# JACK-UP DRILLING PLATFORM

Richard L. LeTourneau, Longview, Tex., assignor to IHC Holland-Letourneau Marine Corporation, Kilgore, Tex.  
Filed Oct. 13, 1972, Ser. No. 297,225

Int. Cl. E02b 17/00

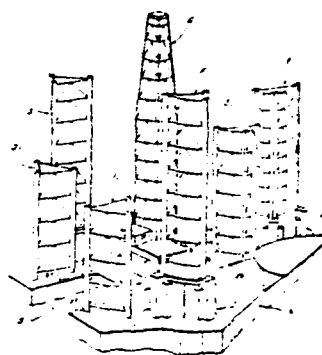
U.S. Cl. 61-46.5

19 Claims

A jack-up type of marine drilling platform has a buoyant hull for use in transporting the platform to the drilling site, with longitudinally separable legs which project upwardly from the hull during transport. The drilling derrick or other upstanding structure is movable on the surface of the hull to adjust the center of gravity of the platform to accommodate environmental conditions. Also, such derrick or structure is used to lift and transport separated upper leg sections to and from stowage positions on the hull.

Keywords: Offshore platform, jack up; Offshore platform, leg

U.S. Cl. X.R. 254-107



3,830,187

# LINE-POST COUPLING AND MARINE MOORING-TOWING DEVICES

Welbourne D. McGahee, Melbourne, Fla., assignor to Look A. Line, Inc., Melbourne, Fla.

Division of Ser. No. 296,107, Oct. 10, 1972, Pat. No.

3,780,690. This application Sept. 4, 1973, Ser. No. 394,109

Int. Cl. B63b 21/00, 21/04

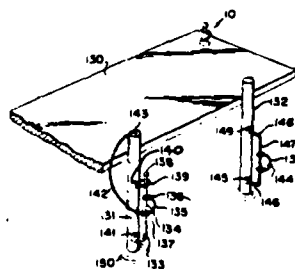
U.S. Cl. 114-235 A

17 Claims

Line-post couplings with marine mooring-towing and other applications having a post with an enlarged head and with mounting members including a fixed or movable clevis member whereby a line with a loop may be quickly attached and detached without the necessity of tying and untying knots. The enlarged head may be integral with the post or detachable. The clevis may include a pair of rings and be movable on the post or one ring may be omitted and the lower clevis end affixed to the post or post base. A line anti-fraying member may also be affixed to the clevis. The device may be mounted on a tow truck, dock, or a boat, and with slight modification the device may be mounted on dock pilings and bollards or lock walls with or without a float member

Keywords: Small-craft mooring device

U.S. Cl. X.R. 114-230





AUGUST 27, 1974

3,831,385

**ARCTIC OFFSHORE PLATFORM**

Thomas A. Hudson, Balboa Island, and Gordon E. Strickland, Jr., Yorba Linda, both of Calif., assignors to Chevron Research Company, San Francisco, Calif.

Filed June 26, 1972, Ser. No. 266,084

Int. Cl. E02b 15/02, F24j 1/00

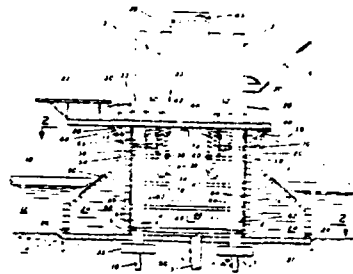
U.S. Cl. 61—46.5

15 Claims

Keywords: Ice protection; Offshore platform, fixed; Offshore platform, jack up; Offshore structure fender

U.S. Cl. X.R. 61-1; 114-40; 165-47

A method and apparatus for reducing ice forces on a marine structure erected in a body of water which becomes frozen through natural weather conditions. The structure has a wall of heat transmitting material forming its perimetrical surface in the zone where natural ice will freeze onto or impinge against the structure. Enclosed chambers are built within the structure and in heat transmitting relationship with the outer wall and heat is applied to the chambers to heat and maintain the outer wall at a temperature above the melting point of the natural ice occurring in the water around it. In a preferred embodiment the marine structure is formed with a heated wall which slopes upwardly and inwardly in the area of ice contact to provide a ramp-like surface upon which a sheet of ice will be forced with reduced friction as it moves against the structure. Thus an edge of the sheet of ice will be prevented from adhering to the structure and will be lifted above its normal position on the water surface as the ice moves against the structure, causing the sheet to be bent and fractured, reducing the force imposed by it on the structure.



3,831,538

**FLOATING STRUCTURE FOR THE MOORING OF YACHTS AND OTHER SIMILAR CRAFT**

Pieter Meeusen, Barendrechtseweg 30, Barendrecht, Netherlands

Filed Oct. 24, 1972, Ser. No. 300,392

Claims priority, application Netherlands, Oct. 28, 1971, 7114866

Int. Cl. B63b 35/00

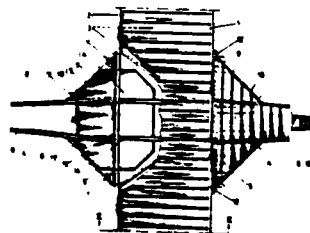
U.S. Cl. 114—5 BD

6 Claims

Keywords: Pier, floating; Small-craft pier

U.S. Cl. X.R. 61-48

A floating structure for the mooring of yachts and similar craft, comprising an elongated main jetty and a number of landing platforms attached to said main jetty and protruding therefrom, in which the landing platforms are considerably wider adjacent to the main jetty than at any distance away from it, the greater part of the buoyancy of both main jetty and landing platforms being formed by a float below the main jetty and the landing platforms in the area where their axes intersect. Moreover there are rigid beams below the main jetty protruding therefrom and supporting the jetty and the landing platforms and connected to the float structure underneath.



3,831,756

**SURFACE TENSION METHOD OF AND APPARATUS FOR SEPARATING IMMISCIBLE LIQUIDS**

Pravin G. Bhuta, Torrance; Robert L. Johnson, Marina Del Rey, and Douglas J. Graham, Redondo Beach, all of Calif., assignors to TRW Inc., Redondo Beach, Calif.

Division of Ser. No. 50,640, June 29, 1970, Pat. No. 3,703,463.

This application Sept. 13, 1972, Ser. No. 288,593 The portion of the term of this patent subsequent to Nov. 21, 1989, has been disclaimed.

Int. Cl. B01d 21/00

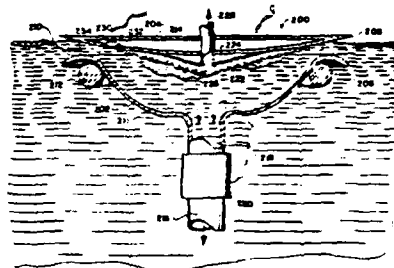
U.S. Cl. 210-109

1 Claim

An apparatus for separating a selected liquid from a second liquid in which the selected liquid is immiscible by a surface tension action utilizing a hollow liquid surface tension separator having a surface tension screen wall is described. The separator is filled with the selected liquid and the outer side of its surface tension screen is placed in contact with the body of immiscible liquids to be separated, such that each screen pore exposed to the second liquid of the body contains a liquid-liquid interface whose interfacial surface tension resists passage of the second liquid through the pore. A pressure differential, less than the critical pressure differential necessary to overcome the interfacial surface tension force acting across the pore, is established across the screen to drive the selected liquid only through the screen into the separator. The primary application of the invention involves the removal or recovery of oil from a water surface utilizing an oil recovery apparatus which floats on and in some cases is propelled along the water surface and is equipped with one or more surface tension liquid separators for extracting the oil from the water surface.

Keywords: Pollutant, suction removal

U.S. Cl. X.R. 210-137; 210-242; 210-DIG.21



SEPTEMBER 3, 1974

3,832,857

**PRESSURE GROUTING**

Max Bassett, Houston, Tex., assignor to C. Nelson Shields, Jr., Trustee, Houston, Tex.

Continuation-in-part of Ser. No. 358,009, May 7, 1973, abandoned. This application Aug. 14, 1973, Ser. No. 388,085

Int. Cl. E02d 5/74, 5/42; E02b 17/00

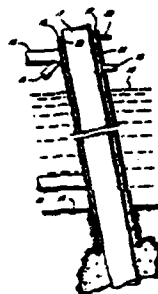
U.S. Cl. 61-46

10 Claims

A method for grouting the annulus between the jacket and piling in the legs of an offshore structure in which air is introduced to expel water from the lower end of the annulus, and the annulus is then filled from the top with grouting material. Water may be pumped down the annulus to wash out mud. Some grout may be pushed out the bottom of the annulus to remove mud or to form a bell foundation.

Keywords: Grouting; Pile, structure connection; Seabed foundation

U.S. Cl. X.R. 61-53.52; 61-53.6; 61-53.74



3,833,075

**EXPENDABLE CORE NOSE AND CORE CATCHER  
RETAINER**

Richard T. Bachman, La Mesa, and Lawrence R. O'Mara, San Diego, both of Calif., assignors to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Oct. 12, 1973, Ser. No. 405,995  
Int. Cl. E21b 25/00, 9/20

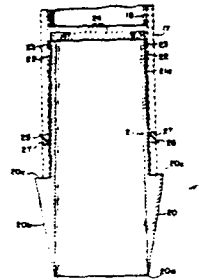
U.S. Cl. 175--20

10 Claims

An improved corer for taking a core sample of marine sediment is dropped onto and embedded in the ocean floor. During penetration, a core sample fills an elongate barrel member. As the corer is withdrawn, a tapered corer nose remains in the sediment while the elongate barrel member is pulled free. Simultaneously, a cylindrically shaped array of flexible fingers are drawn together by an elastic band to retain the core sample inside the barrel member. Since the flexible fingers are held outside of the path of the core sample as it enters the barrel member, there is no disturbance or commingling of the different layers of the core sample when it is being taken. A one-way valve and the flexible fingers cooperate to retain the intact core sample while it is being lifted to the surface to provide an undisturbed specimen for later study by marine geologists and oceanographers.

Keywords: Sampler, seabed-driven core

U.S. Cl. X.R. 175-5; 175-243



SEPTEMBER 10, 1974

3,834,168

**SLIP-JOINTED PILE AND DOLPHIN CONSTRUCTION**

Myke J. Holley, Jr., 1364 Mass Ave., Lexington, Mass. 02173  
Filed Mar. 13, 1973, Ser. No. 340,867  
Int. Cl. E02d 5/22; E02b 17/00

U.S. Cl. 61--46

14 Claims

A marine pile formed by upper and lower lengths of pipe interconnected by a slip-coupling which permits a predetermined amount of axial displacement between these lengths of pipe. This construction has particular application to cluster dolphins of the type wherein the tops of the individual piles are rigidly interconnected.

Keywords: Pile dolphin; Pile section connection; Pile, steel

U.S. Cl. X.R. 61-53

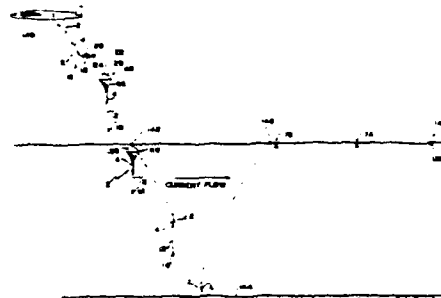




3,834,229  
**METHOD AND APPARATUS FOR MEASURING WATER CURRENTS**  
 Henry J. White, Jr., 18 Pelican Isle, Fort Lauderdale, Fla. 33301  
 Filed Aug. 12, 1971, Ser. No. 171,147  
 Int. Cl. G01w 1/00  
 U.S. Cl. 73-170 A 25 Claims

An instrument package containing three float markers is dropped into a body of water, a first one of the markers being designed to float on the surface. The second and third markers sink to a subsurface level and then are released with a predetermined time delay therebetween, whereupon they ascend to and float on the surface. The relative positions of all three float markers are then charted, and from such chart and the elapsed times both the water current velocity  $V_s$  at the surface and the average current velocity  $V$  from the subsurface level to the surface are calculated.

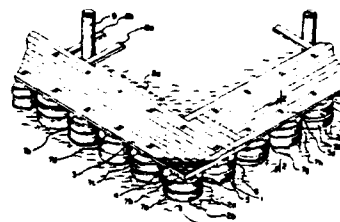
Keywords: Current measurement; Instrument deployment



3,834,336  
**FLOATING SPACE FRAME**  
 Donald E. Peters, 81 Rustic Pl., Staten Island, N.Y. 10308  
 Filed May 21, 1971, Ser. No. 145,773  
 Int. Cl. B63b 35/00  
 U.S. Cl. 114-5 F 7 Claims

A durable float which in a preferred embodiment includes polyurethane filled automobile tires including an attaching rod extending through the center of each polyurethane mass through the center of each tire, with the plurality of the polyurethane filled tires joined between their respective bases and joined between their respective top surfaces with any desired deck structure mounted on top of the joining-structures, each polyurethane-filled-tire unit being spaced from other units at predetermined intervals sufficient to avoid collection of floating debris, to give the desired live load.

Keywords: Pier, floating; Tires



3,834,337

#### SUBMARINE RESERVOIRS

Claude R. Bremaud, Merignac, France, assignor to Societe anonyme dite: Societe Europeenne De Propulsion, Puteaux, France

Filed Feb. 22, 1973, Ser. No. 334,630

Claims priority, application France, Apr. 19, 1972, 72.13823

Int. Cl. B63g 8/22

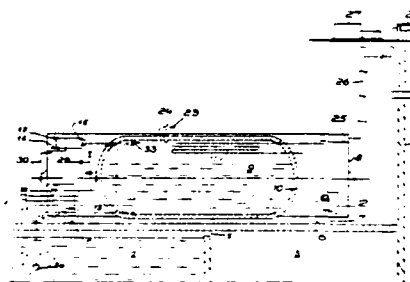
U.S. Cl. 114-16 E

7 Claims

Submarine reservoirs of large dimensions, of the type designed to be towed to the desired location for installation on the seabed, are immersed by drawing compensatory gas stored in the liquid state in an auxiliary enclosure associated with the reservoir, whereby the reservoir is submerged and when located the auxiliary enclosure can be detached from the installed submarine reservoir

Keywords: Offshore construction; Offshore storage tank, submerged

U.S. Cl. X.R. 9-8R; 114-52



3,835,049

#### OIL SPILL CONTROL

Jack A. King, Tulsa, Okla., assignor to Cities Service Oil Company, Tulsa, Okla.

No Drawing. Continuation-in-part of abandoned application Ser. No. 167,805, June 30, 1971. This application Aug. 23, 1973, Ser. No. 390,835

Int. Cl. C02b 9/02

U.S. Cl. 210-63

6 Claims

Hydrocarbon oil floating on the surface of water is recovered by admixing with the hydrogen oil in the presence of oxygen one to fifty parts by weight of a drying oil per one hundred parts by weight of the hydrocarbon oil, wherein at least one of ten carbon-to-carbon bonds of the drying oil are double bonds and wherein the drying oil contains at least one carbonyl moiety per molecule, to coagulate the admixture, and removing the admixture from the surface of the water.

Keywords: Pollutant absorption

U.S. Cl. X.R. 210-50; 210-DIG.21; 252-316

No Figure

SEPTEMBER 17, 1974

3,835,651

**LITTORAL FLOW TRAP OR BASIN**

Arthur B. Butterworth, deceased, late of Smithfield, Va., and  
Roland A. McCoy, executor, Hampton, Va., assignors to  
Helen Libbey Butterworth, Smithfield, Va.

Filed Oct. 27, 1972, Ser. No. 301,514

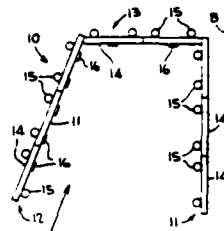
Int. Cl. E02b 3/06

U.S. Cl. 61-4

5 Claims

A littoral flow trap or basin designed to effect the build-up of a beach and to prevent future erosion, including interconnecting inshore and offshore bulkheads open to the littoral flow direction for trapping gravel material and the like therewithin.

Keywords: Breakwater, steel frame; Bulkhead; Groin; Seawall



3,835,653

**UNDERWATER STORAGE DEVICE**

Charles M. Hix, Jr., Bryan, Tex., assignor to Arcadia Refining  
Company, Tyler, Tex.

Division of Ser. No. 879,653, Nov. 25, 1969, Pat. No.

3,675,427. This application Sept. 24, 1971, Ser. No. 183,712

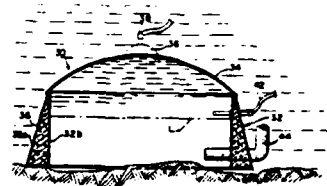
Int. Cl. B65g 5/00; E02b 17/00

U.S. Cl. 61-46.5

5 Claims

An underwater storage device for storing fluids lighter than water wherein a tank is formed of a cylindrical wall having a top closure and an open bottom so that the fluids will enter into the tank and pass upwards toward the top closure. The tank is adapted to be positioned in the water without any rigid restraints.

Keywords: Offshore storage tank, submerged



3,835,654

**SUBMERSIBLE TANKS CONTAINING OIL OR SIMILAR LIQUIDS**

Claude J. Lehanneur, Le Vesinet, France, assignor to Cam-  
penon Bernard Europe, Paris, France

Filed Sept. 8, 1972, Ser. No. 287,237

Claims priority, application France, Sept. 9, 1971, 71.32557

Int. Cl. B65d 89/06; B65g 5/00

U.S. Cl. 61-46.5

15 Claims

Tank for containing oil or a similar liquid, which is im-  
mersed in the sea. This tank comprises a ring of toro shape and  
hollow section, which lies on the ground, and at least one  
elastic membrane peripherally attached to the ring for delimit-  
ing the space where oil is introduced.

Keywords: Offshore storage tank, submerged

U.S. Cl. X.R. 114-.5T; 220-13



3,835,937

**DRILLING AND CUTTING SUBMARINE ROCKS**

Zenjiro Hosao, Tokorozawa; Teiji Shibata, and Siro Yasu-  
kabe, both of Tokyo, all of Japan, assignors to Tobishima  
Kensetsu Kabushiki Kaisha, Tokyo, Japan

Filed May 9, 1973, Ser. No. 358,812

Int. Cl. E21b 7/14

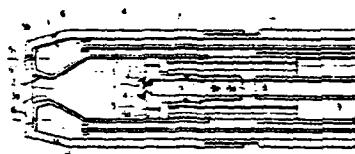
U.S. Cl. 175-6

1 Claim

A flame jet produced by the combustion of a kerosene-ox-  
ygen mixture in a combustion chamber is projected against an  
underwater rock thereby to drill or cut the rock by spalling or  
melting. The flame jet is projected at a pressure of at least 10  
atmospheres higher than the water pressure at the rock being  
drilled or cut. Cooling water is supplied to cool the com-  
bustion chamber walls and the parts of the rock in the vicinity  
of the flame jet.

Keywords: Seabed trencher

U.S. Cl. X.R. 175-14



3,836,004  
**APPARATUS FOR RECOVERING OIL SUBSTANCES  
 FROM THE SURFACE OF A BODY OF WATER**  
 Uncas Favret, P.O. Box 73095, Metairie, La. 70003  
 Filed Dec. 7, 1972, Ser. No. 312,913  
 Int. Cl. E02b 15/04

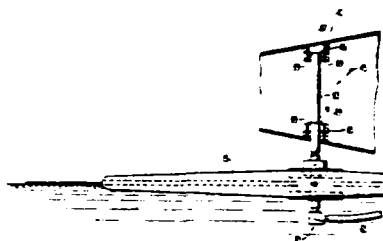
U.S. Cl. 210-242

20 Claims

A buoyant float disposed in a body of water carries oil inlet ports at a level to withdraw primarily oily substance floating on the surface. The ports are sized relative to the size of a communicating oil collection suction chamber so as to permit impeded flow into the chamber and to aid in creation of a vortex like effect tending to withdraw fluid with a heavy concentration of oil. A remote pump connected to a portion of the float provides suction sufficient to withdraw the oily substance from the collection chamber. Where wind may tend to displace the oily substance, a sail-like wind reaction surface which is attached to the float, carries the float, and its oil inlet ports, with the displaced oily substance. The oil inlet ports are disposed so as to be carried preferably above the water level so that in the absence of an upper layer of oily substances, only air is withdrawn.

Keywords: Pollutant, suction removal

U.S. Cl. X.R. 210-DIG, 21



SEPTEMBER 24, 1974

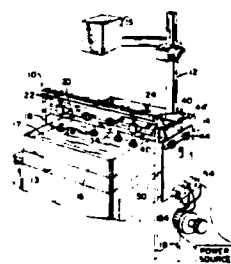
3,837,094  
**WAVE GENERATING APPARATUS FOR STUDY OF  
 WAVE PHENOMENA**  
 Henry E. Mazurek, Glen Ellyn, Ill., assignor to Cenco Incorporated, Chicago, Ill.  
 Filed Jan. 15, 1973, Ser. No. 323,646  
 Int. Cl. G09b 23/12

U.S. Cl. 35-19 R

12 Claims

A wave generating apparatus particularly adapted for use in studying wave phenomena having a plurality of wave source means mounted above a ripple tank and reciprocated vertically by a pair of pivotally mounted parallel rocker arm means to produce waves in the surface of the fluid in the ripple tank. The means driving the rocker arms are adjustable with respect to the rocker arms to vary the amplitude of the waves produced and may be regulated by control means in electrical communication with them to vary the frequency and phase of the waves produced. The bottom of the ripple tank is sloped upwardly from its center to effectively damp the waves in at least one direction. The wave generator and ripple tank may be used in combination with an overhead projector or an overhead light source so that images of the waves produced are projected upon an easily visible plane surface.

Keywords: Hydraulic model basin; Wave generator



110

3,837,169

**REINFORCED MATTRESS FOR PROTECTING  
SHORELINES AND THE LIKE**

Bruce A. Lamberton, 310 Rowan Dr., Berea, Ohio 44017  
Filed Oct. 10, 1972, Ser. No. 296,348  
Int. Cl. E02b 3/12

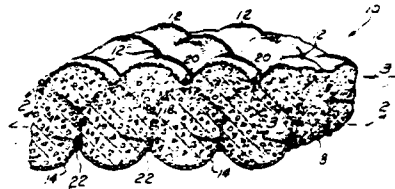
U.S. Cl. 61—38

16 Claims

A pair of sheets of flexible material are interconnected at a plurality of spaced points by a cord system comprising elongated flexible intersecting cord means with the cord means extending between the two sheets and with means interconnecting at least some of the intersecting portions of the cord means whereby a form constructed in this manner may be injected with a cementitious slurry which will inflate the form with the cord means permitting separation of the two sheets for a substantial but controlled amount.

Keywords: Concrete form; Fabric mat; revetment

U.S. Cl. X.R. 5-349



3,837,312

**HYDRAULIC CONTROL MECHANISM FOR HOPPER  
BARGES**

Georg Onderka, Metten, Germany, assignor to Degendorf  
Werft und Eisenbau G.m.b.H., Degendorf/Donau, Germany

Filed Aug. 29, 1973, Ser. No. 392,448  
Claims priority, application Germany, Aug. 31, 1972,  
2242921

Int. Cl. B63b 35/30

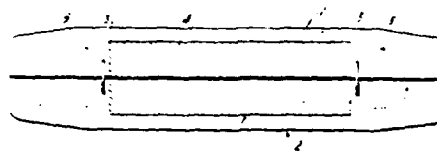
U.S. Cl. 114—29

4 Claims

A hopper barge consists of two barge halves articulated to each other along a longitudinal axis of the barge. First and second cylinder-piston actuators are mounted in respective opposite ends of the barge and connected between the two barge halves. Respective first and second pressure fluid tanks are located adjacent each actuator. A pressure fluid pump is connected by a suction line to the first tank and by a pressure line to a three-position switching valve, and the first tank is connected by a return line to the three-position switching valve. The valve is selectively operable to connect these lines alternately to respective opposite ends of the cylinder of the first actuator. The second pressure fluid tank is connected to the second actuator by a suction line, and an interconnection line extends between the first and second tanks. A common pressure line interconnects corresponding ends of the cylinders at the actuators. A flow line interconnects the opposite ends of the cylinder of the second actuator and has a check valve therein, and a check valve is also provided in the common pressure line. The three-position switching valve has a first position, for opening the hopper barge when the latter is loaded, a second position, for closing an empty hopper barge, and a third position for opening the hopper barge when the latter is empty.

Keywords: Seismic explosive acoustic transmitter

U.S. Cl. X.R. 181-0.5A



3,837,424  
**HIGHLY PENETRATING SEISMIC ENERGY SOUND  
 GENERATOR WITH PULSE SHAPING FOR OFFSHORE  
 SUBSURFACE EXPLORATION**  
 Oswald A. Itria, Bellaire, Tex., assignor to Texaco Inc., New  
 York, N.Y.

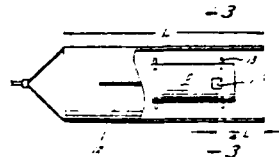
Filed Jan. 26, 1972, Ser. No. 220,941  
 Int. Cl. G01v 1/38

U.S. Cl. 181—0.5 H

13 Claims

A method of increasing the useful seismic energy in a generated primary pulse and at least one article for carrying out the method is disclosed. The article comprises a pneumatic sound generator, as an air gun for generating a primary seismic pulse and an openended elongated cylinder surrounding the air gun and having an end opening are nearest the air gun exhaust ports greater than the area of said ports for shaping the primary pulse so that its dominate frequency will be lowered, placing more of the energy in the useful seismic frequency range, resulting in greater penetration of the seismic signal within the sedimentary section

Keywords: Hopper barge



OCTOBER 1, 1974

3,838,575  
**METHOD OF GROUTING OFFSHORE STRUCTURE**  
 Richard C. Clark, and Floyd A. Jones, both of P.O. Drawer J,  
 Parrish, La. 70380

Filed Sept. 26, 1973, Ser. No. 400,949  
 Int. Cl. E02b 17/00; E02d 5/24

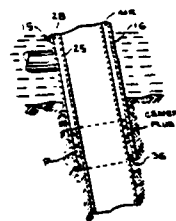
U.S. Cl. 61—46

1 Claim

Compressed air or nitrogen is introduced into an annular space existing between the jacket and piling in the legs of an offshore structure, so that water is expelled from the annular space through the lower end of the jacket. Thereafter the air or nitrogen pressure in the annular space is relieved to permit a predetermined volume of water to reenter the lower end of the jacket and while maintaining the pressure in the annular space grouting material is injected thereinto to commingle with the predetermined water volume to form a plug at the lower end of the jacket. Thereafter the gas pressure is relieved from the column and additional grouting material is then inserted thereinto to fill the space between the plug and the upper end of the column.

Keywords: Grouting; Pile, structure connection

U.S. Cl. X.R. 61-53.52; 61-53.6; 61-54



3,838,657

OFFSHORE MOORINGS

Howard B. Fleming, 89 Pleasant Ave., South Portland, Maine 04100

Filed Dec. 13, 1972, Ser. No. 314,595  
Int. Cl. B63b 21/16

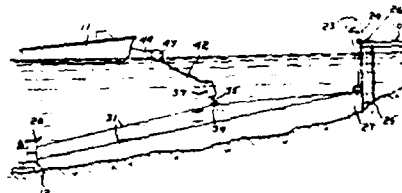
U.S. Cl. 114-230

5 Claims

An offshore mooring for a boat is disclosed that has a mooring anchor at the mooring site provided with an underwater sheave. A line is trained about the sheave to provide courses to the first of which an underwater buoy is attached and with both of which extending to a landing site. The boat is detachably attached to a floating buoy which is connected to the underwater buoy. Both courses extend under water close together between the sites and the boat and the floating buoy may be pulled in to the landing site by pulling in the first course or hauled out to the mooring site by a pull on the second course. At the landing site, the two courses are trained about underwater sheaves and are trained in opposite directions about and secured to the drum of a windlass.

Keywords: Small-craft mooring device

U.S. Cl. X.R. 104-183; 114-206R; 115-7



3,838,741

PILE HAMMERS

Charles R. Pepe, Old Quarry Rd., Closter, N.J. 07620  
Filed May 9, 1972, Ser. No. 251,785

Int. Cl. E02d 7/08, 7/10

U.S. Cl. 173-115

11 Claims

Power hammer for driving piling, and the like, free of valve mechanism likely to require attention and comprising a working cylinder having an anvil at the lower end of the same and a ram operative as a piston in the cylinder, cooperative with the anvil and surrounding walls of the cylinder to form an expansion chamber, the ram having a flow passage extending from an annular groove near the top, down through the lower end to said expansion chamber and the cylinder having pressure supply and exhaust ports to register with said flow passage and to be uncovered by the ram, in lower and upper positions of the ram in the cylinder and whereby the essential functions of the hammer are automatically effected in the normal operation of the ram.

Pressure controlled valves may be added to automatically hold desired pressures and release opposing pressures on the ram.

Keywords: Pile driver, impact

U.S. Cl. X.R. 91-234; 91-236; 92-8; 173-128; 173-136; 173-137



113



3,838,775

DEVICE FOR COLLECTING LOOSE MATERIAL FROM A  
SURFACE, PARTICULARLY OIL FLOATING ON WATER  
Arne Algot Ragnar Larsson, Aursvagen 13, 182 62 Djursholm,  
Sweden

Filed Feb. 28, 1972, Ser. No. 229,845

Claims priority, application Sweden, Mar. 12, 1971,  
3238/71

Int. Cl. E02b 15/04

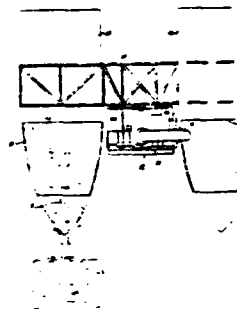
U.S. Cl. 210-242

12 Claims

A device for collecting loose material from a surface, especially oil floating on water, such device employing a drum-shaped rotor rotatable in a relatively closed housing which is provided with an elongated intake opening in the lower portion thereof tangentially displaced relative to the lower portion of the rotor and extending in axial direction across the rotor at the leading side thereof, the housing having a discharge duct communicating with the interior thereof and extending in a direction generally tangentially to the rotor and centrally disposed axially with respect thereto, the rotor being provided with blades of helical configuration forming a centrally disposed ring of material-receiving scoop members substantially aligned with the discharge duct, with said blades being arranged to transport material entering the intake opening toward the scoop members and discharged thereby into said duct.

Keywords: Pollutant, mechanical removal

U.S. Cl. X.R. 210-DIG.21



OCTOBER 8, 1974

3,839,869

BOOM AS A BARRIER FOR OIL SLICKS AND THE LIKE  
ON THE SURFACE OF WATER

Leon G. Green, North Caldwell, N.J., assignor to Metropolitan  
Petroleum Petrochemicals Co., Inc., New York, N.Y.

Filed May 15, 1969, Ser. No. 824,930

Int. Cl. E02b 15/04

U.S. Cl. 61-1 F

14 Claims

The boom comprises a number of non-pneumatic floats arranged in spaced alignment and a flexible web wrapped completely around the floats and bridging the spaces therebetween. The side sections of the web beyond the floats are secured together face to face and weights are attached to the web near the marginal edge of these side sections to form a downwardly extending weighted ballasting fin. The fin forms a hinge connection near the floats to permit the fin to swing about the hinge axis without transmitting its movements to the floats.

Keywords: Pollutant, surface barrier



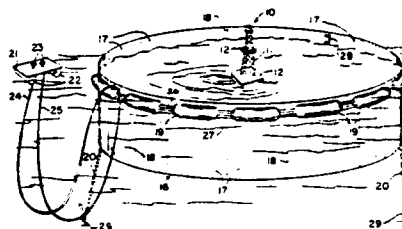
3,839,870  
**OFF-SHORE OIL WELL LEAKAGE CONFINER**  
 Margaret M. Ryan, 10549 S. Bell, Chicago, Ill. 60643  
 Filed Jan. 21, 1974, Ser. No. 435,220  
 Int. Cl. E02b 15/04

U.S. Cl. 61-1 F

3 Claims

The invention relates to an oil confining enclosure for an offshore oil well to provide a barrier against the escape of oil leaking from the drilling operation and includes a floating, generally circular, confining wall encircling an offshore well site and which is supported on a series of interconnected pontoons having operative connection with a floating platform, exteriorly of the confining wall, providing control valves for the connections to the pontoons whereby a vessel may approach the floating platform and by means of the valved connections to the pontoons cause the pontoons to be filled with sea water to sink the confining wall below the level of the sea for access by the vessel to the drilling rig and on the way out again connect with the floating platform valves to blow the water out of the pontoons for the flotation of the circular confining wall.

Keywords: Pollutant, surface barrier



3,839,872  
**METHOD OF SECURING A LARGE-DIAMETER TUBE TO A CASING UNDERWATER**  
 Rene Loire, Paris, France, assignor to Compagnie Generale D'Equiptement Maritime Hersent, Paris, France  
 Filed Apr. 30, 1973, Ser. No. 355,482  
 Claims priority, application France, May 8, 1972, 16379  
 Int. Cl. E02b 1/00; E02d 25/00

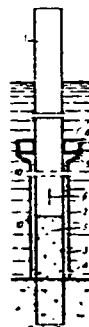
U.S. Cl. 61-46

2 Claims

This invention relates to a method of securing a large-diameter tube to a casing that is submerged under water e.g. in a river or the sea, and wherein one end of this casing rests on a submerged bed with one end of the tube being driven into this bed within the casing, while the other end of the tube is in free air. According to the invention, concrete is injected from the base of said casing into the annular space defined by said tube and said casing so as to drive the water therefrom. The water located within the said tube is removed after forming a concrete plug at the base of said tube, and after this concrete has set in the annular space, longitudinal openings are made in the interior of the said tube so as to expose the inner surface of said casing through the thickness of the set concrete. The edges of these openings are connected to the inner surface of said casing by means of packing-pieces arranged in the space between said casing and said tube.

Keywords: Grouting; Pile, structure connection

U.S. Cl. X.R. 61-53.58



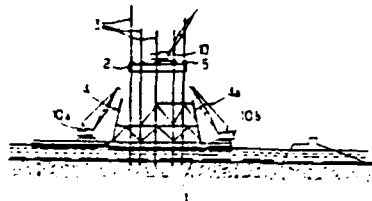
**3,839,873**  
**METHOD OF ERECTING A TOWER ON THE SEA-BED, IN DEEP WATER**

Rene Loire, Paris, France, assignor to Compagnie Generale D'Equipment Maritime Hersent, Paris, France  
 Filed Apr. 30, 1973, Ser. No. 355,483  
 Claims priority, application France, May 8, 1972, 16378  
 Int. Cl. E02d 21/00; E02b 17/00  
 U.S. Cl. 61-46.5

7 Claims

This invention relates to a method of erecting a tower on the sea-bed in deep water where said tower is formed by a submerged pontoon resting on the bed and by an upper platform between which is arranged a bracing pylon secured to said pontoon and wherein the platform rests on a plurality of piles driven through the pylon. According to the invention, a floating pontoon is built which is equipped with a platform having apparatus for lifting it with respect to said pontoon and this pontoon is brought to a sheltered area where the water is shallow and is anchored afloat in that position. The pylon is then constructed on said pontoon after having brought auxiliary columns to rest on the bed through the pontoon these columns then forming guide and support members for auto-lifting apparatus for said platform, and the platform is raised on these columns as the construction of the pylon progresses. The piles may be driven through inclined tubular pillars associated with the pylon.

**Keywords:** Offshore construction; Offshore platform, fixed; Offshore platform, leg; Pile placement; Seabed foundation



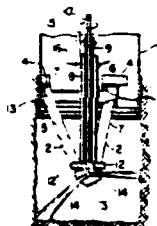
**3,839,875**  
**METHOD AND APPARATUS FOR DRIVING PILES**  
 Kunijiro Matsushita, Toyokawa, Japan, assignor to Kumagai Gumi Company Limited, Fukui-shi, Japan  
 Filed Apr. 4, 1973, Ser. No. 347,978  
 Claims priority, application Japan, July 28, 1972, 47-76255  
 Int. Cl. E02d 7/24  
 U.S. Cl. 61-53.74

2 Claims

An apparatus for driving a hollow pile comprising a rotatable shaft axially removably disposed in said pile and having first spray nozzle means provided at lower end thereof, means for supporting the shaft in said pile and axially removing it out of the pile, means for supplying pressurized fluid to said spray nozzle means to provide radially outwardly directed fluid spray, means for rotating said shaft when the fluid is sprayed through said nozzle means to remove earth below the lower end of the pile so that the pile can be driven into the earth, and further fluid spray nozzle means for providing fluid spray to facilitate upward transportation of the removed earth. A novel method for driving a pile, which uses the aforementioned novel apparatus.

**Keywords:** Pile driver, water jet

**U.S. Cl. X.R. 37-62; 175-67**



116

3,839,984

SAFE AND ARM MECHANISM FOR AN EMBEDMENT  
ANCHOR PROPELLANT

John R. Hives, Somerset, and David J. Pimental, South Dartmouth, both of Mass., assignors to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed May 29, 1973, Ser. No. 364,986

Int. Cl. B63b 21/28

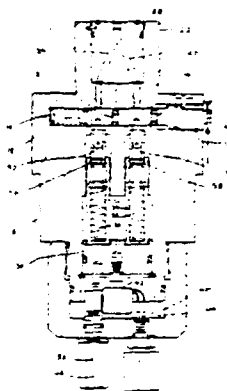
U.S. Cl. 114—206 A

5 Claims

Keywords: Embedment anchor

U.S. Cl. X.R. 102-16

A safe and arm mechanism, for igniting a propellant charge in an embedment anchor which comprises an out-of-line slider housing, two detonators, two adjustable ball release firing pins housed in a chamber above the detonators and actuated by a common piston, and a solenoid valve to admit water under pressure into the chamber. The solenoid valve receives its energy from the surface over a twin-conductor cable. When the mechanism is lowered in water beyond a certain depth after releasing the safety pin, a detonator plunger is moved under hydrostatic pressure so as to bring the detonators in line with the firing pins. When the solenoid valve is actuated by providing power to the solenoid valve, the firing pins are made to strike the detonators, thus setting off the propellant in the anchor barrel and driving the anchor firmly into the ocean floor.



3,840,845

**METHOD OF INITIATING AND COLLECTING SEISMIC DATA RELATED TO STRATA UNDERLYING BODIES OF WATER USING A CONTINUOUSLY MOVING SEISMIC EXPLORATION SYSTEM LOCATED ON A SINGLE BOAT USING SEPARATE STREAMERS**

Robert J. S. Brown, Fullerton, Calif., assignor to Chevron Research Company, San Francisco, Calif.

Filed June 29, 1973, Ser. No. 375,303

Int. Cl. G01v 1.28, 1/38

U.S. Cl. 340-7 R

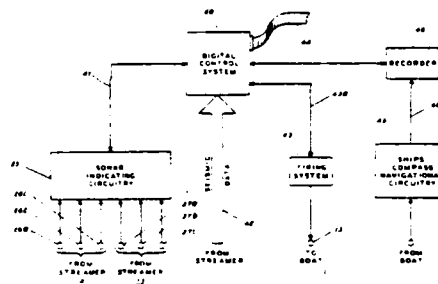
7 Claims

Description is hereinafter had to a method for collecting seismic data related to two-dimensional subsurface coverage of strata underlying a body of water. In accordance with the present invention, a continuously moving marine seismic exploration system includes a repetitive seismic source and two separate streamers of hydrophones trailing behind a single seismic boat traversing the body of water along a straight base course line. The seismic source is fired at a selected repetition rate to generate a series of firing stations coincident with the base course line. The streamers include pluralities of hydrophones connected to the seismic boat by means of a bridle assembly extending from the rear of the boat; the bridle locates each streamer at different depths; each streamer terminates in a paravane assembly connected to its trailing end. In operation, the paravane of a first streamer has a rudder assembly whose position is arranged, as by radio commands from the seismic boat or under mechanically induced programmed commands, to maintain the trailing end of the first streamer along a straight line parallel to the base line and offset from it by a selected but substantially constant distance much greater than that for the leading end of the streamer. Thus, because of forces acting thereon, the first streamer assumes the shape of a modified catenary. On the other hand, the second streamer is arranged to trail behind the boat along a vertical plane substantially coincident with the base course line. The outer boundary of points is equal to one-half the offset distance of the trailing end of the first streamer from the base course line. Since the seismic boat proceeds along the base course line at a constant speed, a grid of depth points including a series of in-line seismic points are obtained. When sets of traces associated with the offset and in-line seismic depth points are processed, the contribution of the normal and cross movement of each trace can be easily determined since the in-line traces are devoid of cross dip movement contributions. In order for the swathe of source-receiver positions at the surface to be clearly identified with the series of center point arrays, the streamers can also be provided with a series of sonic transducers along this length. Sonic pulses are emitted from a transmitter aboard the boat (preferably after seismic source is activated, but before the reflections are received at the hydrophones) and are subsequently detected by the streamer transducers and retransferred

Keywords: Seismic hydrophone array; Seismic record processor; Seismic survey method

U.S. Cl. X.R. 340-15.5MC

back to the boat. In that way, identifying the instantaneous locations of the transducers by means of digital ranging techniques can be achieved. In one form of the invention, the binary indications of the travel time of the sonic wave, and hence the instantaneous positions of the transducers per each shot, are directly encoded onto the field magnetic tape for later use in mapping of the subsurface under survey.



OCTOBER 15, 1974

3,841,103  
CURRENT STABILIZING MEANS FOR ISLAND AIRPORT  
FOUNDATIONS

John W. Magill, Chicago, Ill.  
Filed Sept. 11, 1972, Ser. No. 287,906  
Int. Cl. E02b 1/00

U.S. Cl. 61-46

3 Claims

Current stabilizing means for island airport foundations and which consist of large diameter prestressed concrete conduits which project completely through the foundation in the vicinity of the water line and in the direction of normal water flow past the foundation, together with means for assisting the flow of water through such conduits.

Keywords: Offshore island; Seabed foundation

U.S. Cl. X.R. 61-1; 61-35



3,841,104  
REMOVABLE DOCK  
Billy K. Hufford, R.R. 1, Ansonia, Ohio 45303  
Filed Sept. 10, 1973, Ser. No. 395,428  
Int. Cl. E02b 3/22

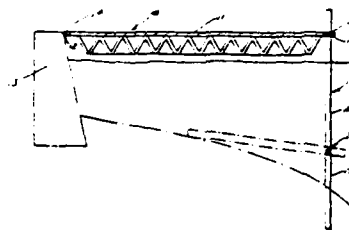
U.S. Cl. 61-48

3 Claims

A dock structure that is easily assembled and/or dismantled for winter storage includes foldable support posts that are readily removable from a gangplank. When disassembled the gangplank is adapted for on shore storage. The shore end of the gangplank is removably connectable to an on shore support. At its opposite end the gangplank is removably connected to and supported by posts which are secured at their lower ends to the bottom formation of a body of water. Submerged, pivotal couplings between the upper and lower ends of the post allow the upper post portions to rotate relative to the lower portions for submerged in water storage of the posts when the dock is disassembled, and maintain the upper and lower post portions in relative rectilinear relationship for supporting the offshore end of the gangplank when the dock is assembled.

Keywords: Pier, fixed; Pier, mobile; Pile section connection

U.S. Cl. X.R. 403-101



3,841,105

**METHOD AND APPARATUS FOR ANCHORING  
UNDERWATER PIPELINES**

Glyn E. Cannon, P.O. Box 55263, Houston, Tex. 77055  
Filed Apr. 9, 1973, Ser. No. 349,272

Int. Cl. F16I 1/00; E02d 5/80

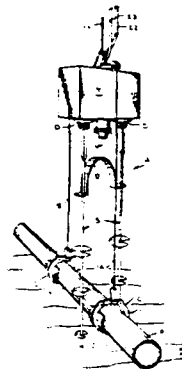
U.S. Cl. 61-72.3

7 Claims

Keywords: Embedment anchor; Seabed pipeline placement

U.S. Cl. X.R. 52-157; 61-53.5

A method and apparatus for installing bottom anchors for anchoring a pipeline on or under a water bottom. Such apparatus includes means for attaching the anchor driving mechanism to the pipe for exerting a downward force on the anchor drive mechanism while the anchors are being driven into the bottom. The present invention also includes means on the anchors for cutting through hard surface formations such as coral or the like.



3,841,106

**PIPELINE ANCHORING SYSTEMS**

Randolph Blumberg, 5533 Redstart, Houston, Tex. 77035

Filed Apr. 18, 1973, Ser. No. 352,357

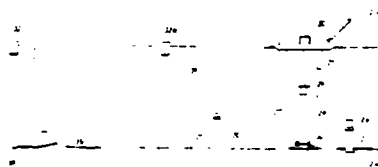
Int. Cl. F16I 1/00

U.S. Cl. 61-72.3

13 Claims

Keywords: Embedment anchor; Seabed pipeline placement

Disclosed is a system for securing or anchoring an underwater pipeline to the floor under a body of water. The anchors consist of elongated members having an inverted U-shaped configuration. An underwater sled is disposed over a pipeline and aligned vertically with respect to a boat. Guide cables between the boat and sled permit lowering of an anchor and its embedment into the floor. Upon setting of an anchor, the buoyancy of the sled is increased and the sled is pulled to a new anchoring location by means of cables attached to the forward end of the sled. The cables are disposed over underwater pulleys to anchors at great lengths in front of the sled and attached to winches on the boat. After the sled has been relocated, the boat is relocated to a position of vertical alignment with the sled in its new position and the operation is repeated.



3,841,156

COMBINED DEPTH INDICATOR AND WATER SAMPLER  
Court L. Wolfe, Pittsburgh, Pa., assignor to Gulf Research &  
Development Company, Pittsburgh, Pa.

Filed Dec. 14, 1972, Ser. No. 315,072

Int. Cl. G01f 23/16; G01n 1/10

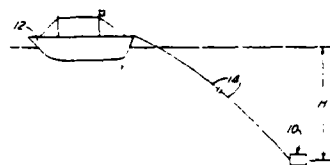
U.S. Cl. 73-291

8 Claims

A device for sampling a fluid such as water and for determining the pressure and therefore the depth of the water at the sampling location. A single hose is used for both upward flow for sample taking and downward flow to operate a back pressure valve having a sealed pre-set loading chamber to resist opening by pressure from the surface. The pressure exerted by the fluid in the hose automatically increases with increasing depth, and thus the surface measured pressure required to open the valve correlates to depth.

Keywords: Depth pressure measurement;  
Instrument, towed; Sampler, water;  
Towed vehicle

U.S. Cl. X.R. 73-300; 73-425.4R



3,841,162

OPERATING APPARATUS FOR WATER SAMPLERS

Terry L. Duperon, Saginaw, Mich., assignor to Trippensee  
Corporation, Saginaw, Mich.

Filed Dec. 13, 1972, Ser. No. 314,498

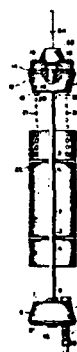
Int. Cl. G01n 1/10

U.S. Cl. 73-425.4 R

10 Claims

A water sampler having a tubular body open at both ends and through which extends a connecting rod fixed at one end to a closure for the lower end of the body and carrying an enlargement at its other end for engagement with and disengagement from a latching clasp supported on a closure for the upper end of the body. The latching clasp comprises a pair of segment-shaped plates between which the enlargement is adapted to be retained, each of the plates having an upstanding motion transmitting member operable to move the plates apart and effect release of the enlargement. The clasp plates preferably are biased to move toward one another by two springs which straddle the connecting rod.

Keywords: Sampler, water





3,841,710  
**METHOD AND APPARATUS FOR MOVING SOLIDS  
 FROM A REMOTE LOCATION**

Thomas M. Boland, Orange, and Frank G. White, Newport Beach, both of Calif., assignors to Shellmaker, Inc., Petaluma, Calif.

Filed Feb. 16, 1973, Ser. No. 333,042  
 Int. Cl. B65g 53/30

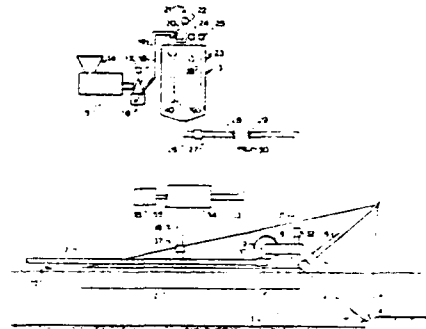
U.S. Cl. 302-14

8 Claims

This invention relates to an improved hydraulic system for conveying a liquid-solids slurry over relatively long distances without reducing the consistency of the slurry. More specifically, this invention relates to an improved hydraulic system that eliminates or substantially reduces the number of booster or auxiliary pumping units needed to maintain appropriate flow conditions when conveying a liquid-solids slurry over relatively long distances. This is brought about by selectively adding a surfactant to the slurry being conveyed in response to a deposition indicator that senses the rate of settlement of solids on the lower portion of the conduit conveying the slurry.

Keywords: Dredge-spoil transport

U.S. Cl. X.R. 37-58; 61-36R; 137-13;  
 175-38; 222-68



3,841,988  
**CONTROL FOR IMPRESSED CURRENT  
 CATHODIC PROTECTION SYSTEMS**

James D. Gleason, Cucamonga, Calif., assignor to Lockheed Aircraft Corporation, Burbank, Calif.

Filed Mar. 12, 1973, Ser. No. 339,747  
 Int. Cl. C23f 13/00

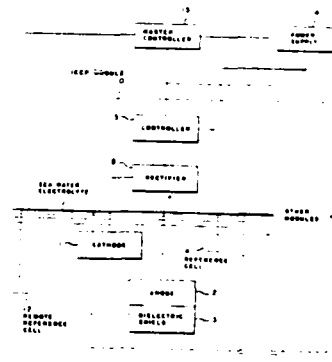
U.S. Cl. 204-196

9 Claims

A control system for cathodic protection wherein a plurality of modules (local) consisting of an anode, reference cell mounted on a structure to be protected, such as a ship's hull, and associated with a control circuit and rectifier. In addition a remote reference cell and a master controller are employed along with control logic so that when the remote reference cell reading is low the master control provides an "on" signal to the modules. If the reference cell voltage at the module is below a safe limit, a cathodic voltage is supplied by the module. When the safe limit at the module is reached the module turns off.

Keywords: Cathodic protection; Corrosion prevention

U.S. Cl. X.R. 204-147; 204-231



OCTOBER 22, 1974

3,842,521

**SUBMERSIBLE DREDGING PUMP AND SHOVEL  
ARRANGEMENT WITH SUSPENSION AND TOWING  
MEANS THEREFOR**

Giovanni Faldi, Via Forese Donati 27, Firenze, Italy  
Filed Mar. 7, 1973, Ser. No. 338,976  
Int. Cl. E02f 3/92, 3/94

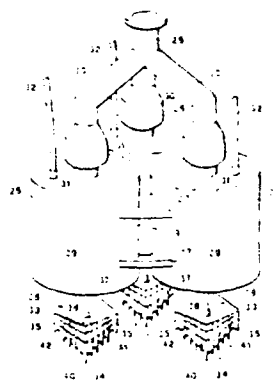
U.S. Cl. 37-57

4 Claims

A submersible dredging pump and shovel arrangement comprising a compressed air pump and disintegrating and conveying shovels which are suspended and towed along a dredging trajectory, the pump comprising three cylinders arranged for being filled with the dredged material and pumping it in sequence by means of compressed air cyclically fed to the cylinders under the control of a distributor, each cylinder being connected to a corresponding dredging shovel having a front cutting edge, which in turn is provided with cutting knives inclined forwardly and downwardly so as to sink in the bed being dredged.

Keywords: Dredge, suction; Dredge intake; Pump

U.S. Cl. X.R. 37-59; 37-71; 172-628



3,842,522

**METHOD FOR HYDRAULICALLY RAISING ORE AND  
OTHER MATERIALS**

Kurt Holzenberger, Frankenthal/Pfalz, and Otto Schiele, Neudtadt/Weinstrasse, both of Germany, assignors to Klein, Schanzlin & Becker Aktiengesellschaft, Frankenthal, Pfalz, Germany  
Division of Ser. No. 195,920, Nov. 5, 1971, Pat. No. 3,753,303.  
This application Dec. 4, 1972, Ser. No. 312,119  
Claims priority, application Germany, Nov. 10, 1970, 2055132

Int. Cl. E02f 3/88

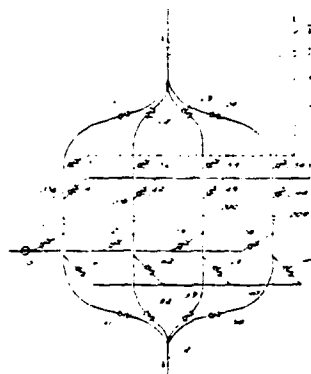
U.S. Cl. 37-195

3 Claims

A plurality of containers in a riser conduit cooperate cyclically with a main suction pump and a flushing pump. Control valves are cyclically operated so that the main suction pump exhausts clear flushing water from one container, whereby a pressure differential is produced for raising an ore-water mixture in the lower portion of the riser conduit to the level of the container, while the ore-water mixture in another container is flushed through the upper riser conduit portion to the surface level. Between two and four containers can be used for the cyclical operation so that the ore-water mixture flows continuously out of the upper riser conduit portion, while any contact between the material and the main suction pump and the flushing pump is avoided.

Keywords: Dredge, suction; Pump

U.S. Cl. X.R. 37-59; 302-66



3,842,606

BEACH-PROTECTORS

Wade Stiles, P.O. Box 151, Palm City, Fla. 33490, and George V. R. Dunan, 4170 Reynolds Ave., Miami, Fla. 33133  
Continuation of Ser. No. 788,495, Feb. 4, 1969, abandoned.  
This application Mar. 16, 1972, Ser. No. 235,446  
Int. Cl. E02b 3/12

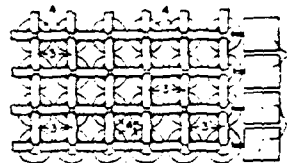
U.S. Cl. 61-38

9 Claims

Means for controlling shore drift and erosion caused by moving water and improvements in beach protection consisting in the use of used automobile, truck, and other vehicular pneumatic tires, said tires being connected to each other and forming spaces within the arrangement and means for anchoring the tires where necessary. The used tires are laid as a mat creating solids and walled voids. The mat's solids are unique in that they are both flexible and resilient and aid Nature's own pattern of sand retention. Sand is deposited both in and around the tires as the surf tumbles shoreward and again as the swash and undertow gravitates seaward. The tires also form a flexible and resilient barrier to protect the present beach from the turbulent waters of the surf.

Keywords: Bar protection; Low-cost shore protection; Tires; Wave absorber beach

U.S. Cl. X.R. 61-3



3,842,607

ARCTIC ISLANDS

Ray M. Kelseaux, and Jerry W. Biles, both of Tulsa, Okla., assignors to Cities Service Oil Company, Tulsa, Okla.  
Filed July 13, 1973, Ser. No. 379,139  
Int. Cl. E02d 21/00

U.S. Cl. 61-46

38 Claims

Artificial permafrost islands are constructed in Arctic sea waters to provide offshore sites from which oil and gas wells can be drilled. Sand and gravel are dredged from the floor of the sea and are redeposited at another location where an island is desired. The dredging and redepositing of sand and gravel are continued until a suitable insular shape and height are obtained. Subsequently, a slurry of silt in sea water, also obtained from the floor of the sea, is deposited on the heap of sand and gravel. A thickener, e.g., a gellant or a viscosifier, is incorporated into the slurry to effect consolidation of the ingredients so that they do not flow back into the sea after the slurry has been deposited on the island. The water of the thickened slurry eventually freezes upon exposure to the sub-zero temperatures of the environment, thereby converting the island into a permafrost structure which serves as a solid platform for a drilling rig, materials, equipment, housing, storage, etc.

Keywords: Offshore construction; Offshore island

U.S. Cl. X.R. 61-36; 61-50

No Figure

3,842,779

**BOAT MOORING AND GUARD DEVICE**

Harry E. Jaynes, 616 N. Old Rand Rd., Lake Zurich, Ill.  
60047

Filed Oct. 13, 1971, Ser. No. 188,892

Int. Cl. B63b 21/00

U.S. Cl. 114-230

6 Claims

A boat mooring device comprising a bow-shaped frame member with a cable or the like attached thereto and with a slidable member supported on said cable and secured to a boat so that as the movement of the water causes the boat to move up and down, as well as in other directions, the sides of the boat will bear against the slidable member and will move it to correspond to the up and down movement of the boat and thereby prevent scuffing and damage to the boat. Also, the device will absorb the shock incident to the impact of the boat against the device.

Keywords: Pier fender; Small-craft mooring device

U.S. Cl. X.R. 114-219



3,842,917

**PUMPED EVACUATED TUBE WATER HAMMER PILE DRIVER**

Serge S. Wisotsky, Sharon, Mass., assignor to Orb. Inc., Marion, Ohio

Continuation-in-part of Ser. No. 163,422, July 16, 1971, abandoned. This application June 30, 1972, Ser. No. 267,741

Int. Cl. E02d 7/02

U.S. Cl. 173-90

18 Claims

Driving piles with a liquid ram or spear generated in a pumped, evacuated tube. Various configurations are shown, including those in which the pile itself defines at least a portion of the working chamber for generating water hammer, and others in which the working chamber is defined at least in part by tubes other than the pile.

Keywords: Offshore construction; Pile driver, impact; Power, submerged source

U.S. Cl. X.R. 61-53.5; 173-1; 173-116; 175-6



3,843,517

# METHODS FOR ELIMINATION OF OIL SLICKS

Robert W. McKinney, Adelphi, Md., Andrew L. Dixon, Jr., Wickliffe, Ohio, and Raymond L. Jordan, Baltimore, Md., assignors to W. R. Grace & Co., New York, N.Y.

Keywords: Pollutant absorption

U.S. Cl. X.R. 195-3H; 210; DIC.21

No Drawing. Continuation-in-part of abandoned application Ser. No. 1,512, Jan. 8, 1970. This application Dec. 17, 1970. Ser. No. 99,253

Int. Cl. C02b 9/02

U.S. Cl. 210-11

10 Claims

No Figure

In a preferred mode, cultures containing hydrocarbon and oil consuming microorganisms with or without nutrients are adsorbed in a carrier such as clays, vermiculites, silica gels, perlites and similar materials and freeze-dried to form useful compositions. These compositions are placed on oil films or layers which are on fresh or salt water, or on beaches or river banks, or in storage tanks, ships tanks and so on. The carrier adsorbs and concentrates the oil in the presence of the microorganisms and the microorganisms consume the oil. The microorganisms remain viable in these compositions even after long storage periods. In an alternative composition, the microorganisms may be freeze-dried and then admixed with a carrier such as clays, vermiculites, perlites, silica gels or so on.

OCTOBER 29, 1974

3,844,122

# PROTECTED OFFSHORE STORAGE FACILITY

Woodrow E. Bliss, Jr., Pittsburgh, Pa., assignor to Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa.

Filed Apr. 26, 1973. Ser. No. 354,639

Int. Cl. E02b 3/00, 3/04

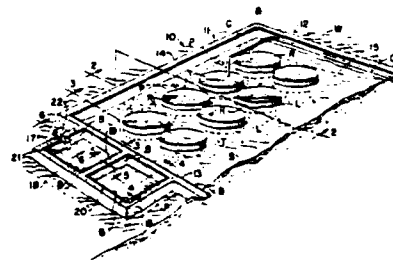
Keywords: Breakwater, concrete; Offshore storage tank, emergent; Pollutant collection

U.S. Cl. X.R. 61-46; 114-.5T

U.S. Cl. 61-1

10 Claims

In combination, a diked area in a body of water, a floating tank moored in the diked area for storing liquid of less density than the density of water, and a fixed roof on the tank.



3,844,123  
**DEVICE FOR PRODUCING AND PROTECTING  
 DEPOSITS OF SEDIMENTARY MATERIAL ON THE  
 FLOOR OF BODIES OF WATER**  
 Ole Jeppe Fjord Larsen, Fasanvaenget 62, Hjerting, Denmark  
 Filed Dec. 27, 1971. Ser. No. 212,056  
 Int. Cl. E02b 3/04

U.S. Cl. 61-3

9 Claims

Apparatus for producing and protecting deposits of sedimentary material on a floor of a body of water, said apparatus comprising an elongated flexible sheet located beneath the surface of the water in at least partially upwardly spaced relationship close to but above said floor, means for maintaining said flexible elongated sheet so positioned, said flexible elongated sheet includes a longitudinally extending central portion and longitudinally extending side portions diverging relative to said floor, where said maintaining means are a plurality of beams transversely spanningly supporting the underside of said flexible sheet along spaced points of the length thereof, and means spaced along said longitudinally extending side portions for anchoring the same to said floor.

Keywords: Bar protection; Fabric mat; Seabed scour protection



3,844,124  
**CONTROL OF EROSION**  
 Earl Silas Tupper, Panama City, Panama, assignor to Tup  
 (Panama) S.A., Panama City, Panama  
 Filed Jan. 23, 1973. Ser. No. 326,083  
 Claims priority, application Great Britain, Jan. 28, 1972,  
 4017/72

Int. Cl. E02b 3/04; E02d 3/14

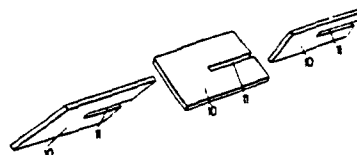
U.S. Cl. 61-3

7 Claims

A length of mechanically strong material of cross-shaped cross-section, when placed along a beach, is resistant to tipping on wave-impact and prevents or hinders erosion. It can be made of concrete, in the shape of a cross of four equal arm lengths, either integrally or as interlocking slotted slabs. These slabs can also be built up into a chain of indefinite length, thus preventing gaps between individual members.

Keywords: Breakwater, concrete; Concrete armor unit; Low-cost shore protection; Wave absorber beach

U.S. Cl. X.R. 52-726; 61-35; 61-37



## ANTI-EROSION DEVICE

Jimmie Driver Williams, Sr., 203 Pritchard St., Williamston,  
N.C. 27909

Filed July 13, 1973, Ser. No. 379,145

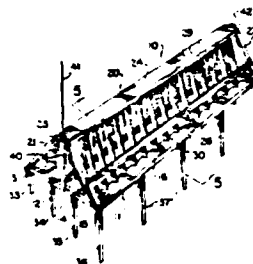
Int. Cl. E02b 3/04

U.S. Cl. 61-3

## 6 Claims

**Apparatus for controlling erosion of the earth primarily in sand and beach areas by water and wind. The apparatus includes a frame having a substructure to be embedded in the earth and a superstructure for trapping and retaining earth which is being displaced by either water or wind.**

**Keywords:** Bar protection; Breakwater. steel frame; Sand fence; Seabed foundation



3.844.941

### USE OF SULFUR FOR COMBATting OIL SPILLS

Lloyd W. Jones, Tulsa, Okla., assignor to Amoco Production Company, Tulsa, Okla.

Filed Feb. 1, 1971, Ser. No. 111,418

Int. Cl. C02b 9/02

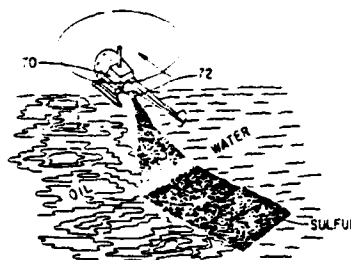
U.S. Cl. 210-40

## 29 Claims

This invention relates to water pollution control and concerns a system for combatting the problems which occur when oil is spilled upon a body of water. It concerns a method in which sulfur is spread over the spilled oil to hold the oil mass together to permit it to be easily removed from the body of water. In a preferred embodiment, molten sulfur is sprayed as very fine strands over and around the periphery of an oil spill to enmesh the oil in a sulfur web and keep it confined. In another embodiment, sulfur powder is spread over the oil and tends to hold it together. In those cases where sinking of the oil is the most practical solution to the oil spill problem, greater amounts of powdered yellow sulfur, e.g., at least about three parts by weight of sulfur to one part crude oil, is applied. The oil captured by the sulfur is easily recovered with the sulfur and separation of the oil and sulfur is easily obtained by heating and gravity separation.

**Keywords:** Pollutant absorption; Pollutant collection; Pollutant, surface barrier

U.S. CI. X.R. 210-67; 210-DIG.21



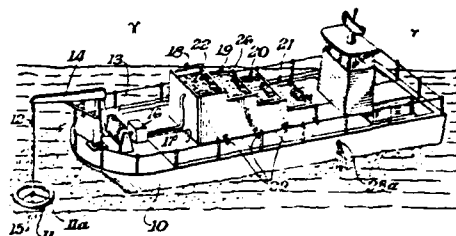
3,844,944  
**APPARATUS AND METHOD FOR EFFECTING  
 SEPARATIONS**  
 Louis Mercuri, 11 Linda St., Newark, Del. 19711  
 Filed June 27, 1972, Ser. No. 266,596  
 Int. Cl. E02b 15/04  
 U.S. Cl. 210-73

3 Claims

This invention provides an apparatus for separating a mixture of immiscible liquids. A plurality of containers is provided each of which acts as a separator and each of which receives processed fluid by gravity flow from the container immediately preceding it. In effecting separations, the lighter of the two liquids is allowed to go to the top and the heavier of the liquids, successively containing a lesser amount of the lighter in successive separators, is passed to the next separation container. In the separation chamber, there is a wall that affords an opening near the bottom of the container to allow flow to the next container, each container thus, in effect, having two chambers. The first chamber receives the mixture containing a greater amount of the lighter material and as separation occurs, the second chamber receives a mixture which contains lesser amounts of the lighter material. The second chamber contains an outlet to the separation container next to it which is shorter in height. Thus, the separations and the flows are effected by gravity. The lighter of the immiscible liquids is either skimmed off the top or, when a given separation chamber contains practically all of the lighter material, the lighter material is passed to a separate storage means. This invention is directed towards the recovery of oil in oil spills and the prevention of pollution in streams, lakes and the like.

Keywords: Pollutant removal watercraft

U.S. Cl. X.R. 210-83; 210-242; 210-DIG.21



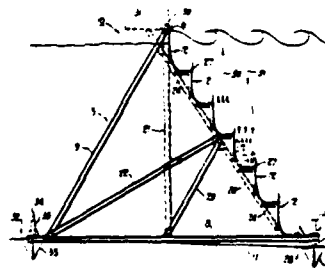
NOVEMBER 5, 1974

3,845,630  
**MECHANICAL REEF**  
 Joseph Karnas, 127 Miller Rd., Avon Lake, Ohio 44012  
 Filed July 25, 1973, Ser. No. 382,304  
 Int. Cl. E02b 3/04  
 U.S. Cl. 61-4

11 Claims

A mechanical reef structure characterized by stepwise arranged deflector panels having a configuration which is effective to cause the vertically moving water in waves to absorb its own energy so that the waves are attenuated and the sand and other particulate matter carried by the water is deposited below and in front of the reef.

Keywords: Bar protection; Breakwater, steel frame





3.845.633

**INTERCEPTOR FOR PREVENTING SHIP COLLISIONS  
WITH OFFSHORE POWER STATIONS AND THE LIKE**  
Roland P. Hammond, Oak Ridge, Tenn., assignor to The  
United States of America as represented by the United States  
Atomic Energy Commission, Washington, D.C.

Filed Dec. 13, 1973, Ser. No. 424,256

Int. Cl. E02b 3/20

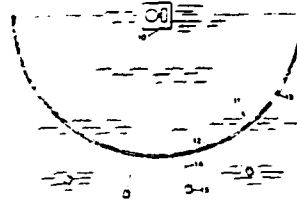
U.S. Cl. 61-46.5

1 Claim

There is provided an encircling network of floating intercepting elements about a fixed installation in a body of water, each attached to radially extending anchor units whereby the network decelerates a ship or other engaging body to prevent collision with the installation. The anchors are designed to move across the floor of the body of water to produce a given drag whereby connecting cables are tensioned but not broken during the deceleration.

Keywords: Collision protection; Offshore structure fender

U.S. Cl. X.R. 61-17



NOVEMBER 12, 1974

3.846.988

**SWELL DAMPER**

Jacques Edouard Lamy, Fontenay-aux-Roses, France, assignor  
to C. G. Doris (Compagnie Generale pour les Developpement  
Operationnels des Richesses Sous-Marines), Paris, France

Filed May 9, 1973, Ser. No. 358,500

Claims priority, application France, May 10, 1972,  
72.16869

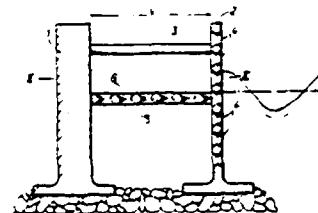
Int. Cl. E02b 3/06

U.S. Cl. 61-3

20 Claims

A device for providing protection against swells, in which there is provided a curtain formed between a volume of water in which the swell develops and a structure or a zone requiring protection, the curtain has its base immersed in the volume of water concerned and its top located advantageously above the crest of the highest waves occurring in the volume of water, and offers, for the passage of the water, ducts which have a profile flared towards the structure or zone being protected, with a sufficiently steep gradient of section for the water to break away from the walls of the ducts and produce eddies which dissipate the water energy.

Keywords: Breakwater, concrete; Offshore caisson; Seawall



3,846,990

# FLOATING WAVE BARRIER

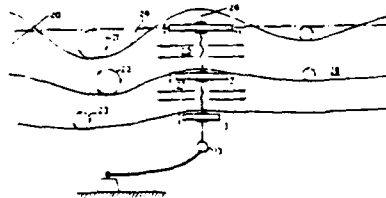
Wallace William Bowley, Stafford Springs, Conn., assignor to William Barney Ritchie, Jr., Duxbury, Mass., a part interest  
Continuation-in-part of Ser. No. 267,086, June 28, 1972, abandoned. This application May 7, 1973, Ser. No. 357,938  
Int. Cl. E02b 3-04

Keywords: Breakwater, floating; Buoy mooring system

U.S. Cl. 61-5

14 Claims

A floating anchored wave barrier is provided comprising a plurality of plates, each having a relatively great horizontal extent compared to its thickness and connected by a flexible line. The buoyancy and mass of the plates are such that when the barrier is placed in water, the top plate is positioned at or near the water surface. The remaining plates are submerged but near the water surface so that they are located within the top portion of the wave where the major portion of the wave kinetic energy is encountered. The plates are relatively thin and move vertically within the water and out of phase with each other so that water between the plates is placed under a compressive force thereby reducing the vertical wave velocity component and accelerating the horizontal wave velocity component to form a reflected wave and a transmitted wave. The reflected wave reduces the kinetic energy of other incident waves and the transmitted wave fills in the wave trough of water past the barrier thereby reducing the vertical wave velocity component of the water in the trough.



3,846,991

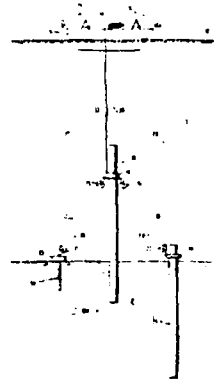
# PILE DRIVING METHOD AND APPARATUS

Serge S. Wisotsky, c/o ORB Inc., 89 Bullard St., Sharon, Mass. 02067, assignor to ORB Inc., Marion, Ohio  
Continuation-in-part of Ser. No. 163,422, July 16, 1971, abandoned. This application June 30, 1972, Ser. No. 267,752  
Int. Cl. E02d 7/00, 7/18, 7/20  
U.S. Cl. 61-53.5

Keywords: Offshore construction; Pile driver, impact; Pile driver, vibratory; Pile placement

U.S. Cl. X.R. 61-46.5; 173-1; 173-49; 175-19; 254-188

Driving of piles into submerged lands with a steadily applied force of sufficient magnitude to appreciably deflect the sub-soil, with or without superimposed driving pulses.

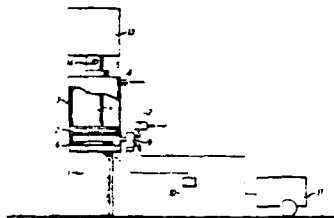


3,847,230  
**SYSTEM FOR DRIVING OBJECTS USING PRESSURE OR TRACTION FORCES**  
 Oskar Vive Elom Blomquist, Enskede, Sweden, assignor to Stabilator Aktiebolag, Bromma, Sweden  
 Filed Aug. 16, 1972, Ser. No. 280,945  
 Claims priority, application Sweden, Aug. 26, 1971, 10831/71  
 Int. Cl. E02d 7/10  
 U.S. Cl. 173-127 4 Claims

An arrangement for driving objects, such as piles for example, into a receiving surface by pressure or traction forces is herein disclosed. The arrangement includes a piston-cylinder arrangement one end of which is in force transmitting engagement with an object to be driven into a receiving surface and the other end of which is loaded with an anvil means. The cylinder space on one side of the piston is in communication with a supply source of pulsating working medium and the cylinder space on the other side of the piston communicates with an outlet to enable free entry and discharge of the working medium.

Keywords: Pile driver, impact; Pile driver, vibratory; Pile extractor

U.S. Cl. X.R. 61-53.5; 173-1; 173-131; 173-135

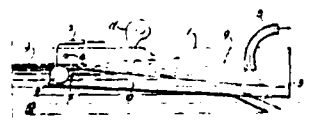


3,847,815  
**SCOOP FOR COLLECTING A LAYER OF POLLUTING MATERIAL ON WATER SURFACES**  
 Lucien Chastan-Bagnis, 21 Avenue Isola Bella, 06400 Cannes, France  
 Filed Jan. 31, 1973, Ser. No. 328,310  
 Claims priority, application France, Feb. 4, 1972, 72.05078  
 Int. Cl. E02b 15/04  
 U.S. Cl. 210-242 3 Claims

The disclosure relates to a device for collecting hydrocarbons, granular materials, absorbing bodies and various polluting agent which float as a layer on the surface of water such as sea, lakes, rivers, harbours, estuaries, pools, etc. The device operates by producing a sufficiently thick layer of polluting material so that it can be collected. It comprises a scoop having substantially the shape of a circular sector and a header with diffusing tubes circulating water under pressure towards the rear of the scoop where it is allowed to escape through a suitable opening. The thickened layer of polluted material which floats on top of water is removed through a separate duct.

Keywords: Pollutant collection; Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.21



3,847,816  
**POLLUTION SUCTION WATER SWEEPER**  
 James DiPerna, 85 Foxhill Ter., Staten Island, N.Y. 10315  
 Filed Mar. 7, 1973, Ser. No. 339,381  
 Int. Cl. E02b 15/04  
 U.S. Cl. 210-242 1 Claim

A vessel equipped with an apparatus to sweep the surface of a body of water and remove floating oil therefrom, the vessel comprising an oil tanker ship containing a series of oil collection tanks within its hold, a floating oil harvesting ring being towed in front of the ship by director tugs that are electronically controlled from the ship, the harvesting ring including a skimmer section into which gathered floating oil is sucked and conveyed from the skimmer through intake tubes to the interior of the ship, where it is passed into the series of tanks.

Keywords: Pollutant collection; Pollutant, removal watercraft; Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.21



3,848,226  
**HIGH CAPACITY UNDERWATER ACOUSTIC RELEASE**  
 George R. Perez, Alexandria, Va., assignor to AMF Incorporated, White Plains, N.Y.

Filed Apr. 17, 1973, Ser. No. 352,023  
 Int. Cl. B66c 1/34

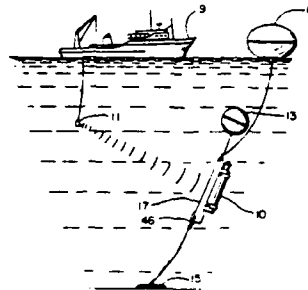
U.S. Cl. 340-5 R

9 Claims

A high capacity underwater acoustic release means is described. A tubular housing is provided for containing an electronic acoustic receiver for detecting a coded acoustic command signal and a detonation means for actuating a release mechanism in response to the detection of said command signal. The release mechanism is coupled to the exterior of said receiver housing and includes a pair of evenly spaced support plates having a release linkage means disposed therebetween. The support plates extend longitudinally of said receiver housing beyond both ends thereof and are provided at one end with a shackle means for attachment to a cable or other suitable means. The release linkage is disposed between said plates at said other end and includes at least one pivotally mounted release arm operatively associated with the detonation means, and a pivotally mounted pelican hook. The load to be released is supported by said pelican hook until said release linkage is actuated by said detonation means.

Keywords: Buoy mooring system; Instrument retrieval

U.S. Cl. X.R. 9-8R; 294-83AE; 340-16C



NOVEMBER 19, 1974

3,848,417  
**SELF-RIGHTING FLOATING BOOMS**  
 Millard F. Smith, 2 Harding Ln., Westport, and Anthony V. Anusauckas, Fairfield, both of Conn., assignors to said Smith by said Anusauckas

Division of Ser. No. 164,606, July 21, 1971, Pat. No. 3,756,031, which is a continuation-in-part of Ser. No. 815,663, April 14, 1969, Pat. No. 3,638,430. This application May 17, 1973, Ser. No. 361,335  
 Int. Cl. E02b 15/04

U.S. Cl. 61-1 F

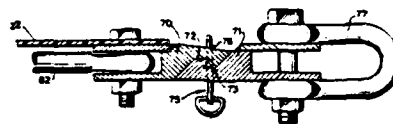
4 Claims

A unique self-righting and quickly deployable floating boom capable of enduring strong winds and waves comprises a series of polymer floats each incorporating a horizontally extending shelf securely attached at spaced intervals to an integral composite fin of vinyl sheet reinforced by woven polyester fibers incorporating an inter-woven core of two characteristically different fibers that provide the vinyl sheet with different vertical and horizontal flexing capabilities. An extension shelf formed on each of the polymer floats provides the boom with additional buoyancy while also serving as a barrier effectively containing oil and other floating materials despite wind, choppy water and strong waves. Furthermore, the extension shelves incorporate fore and aft lifting surfaces which tend to

Keywords: Pollutant, surface barrier

U.S. Cl. X.R. 24-201HH

induce "planing" and counteract the forces which tend to draw the floating boom beneath the water surface during fast end-wise deployment. The dual fiber core of the vinyl sheet is manufactured with relatively thin horizontal fibers interwoven with relatively stiff, thick vertical fibers to allow the vinyl sheet to flex easily about vertical flexing axes while strongly resisting horizontal flexing about horizontal flexing axes.



3,848,419

# FLOATING WAVE BARRIER

Wallace William Bowley, Stafford Springs, Conn., assignor to William B. Ritchie, Jr., Duxbury, Mass., a part interest  
Continuation-in-part of Ser. No. 357,938, March 7, 1973, which is a continuation-in-part of Ser. No. 267,086, June 28, 1972, abandoned. This application July 27, 1973, Ser. No. ~383,346

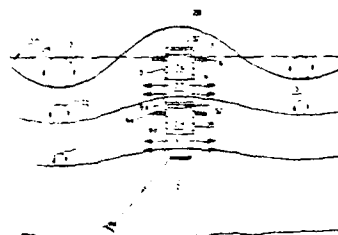
Int. Cl. E02b 3/04

U.S. Cl. 61-5

9 Claims

A floating anchored wave barrier is provided comprising a plurality of buoyant members connected by a flexible line. At least one of the members is an inverted vessel having an annulus attached to the periphery of the vessel. The buoyancy and mass of the members are such that when the barrier is placed in water, the top vessel is positioned at or near the water surface and each vessel is partially filled with air. The remaining members can be a vessel having an annulus attached thereto or a disk having a relatively great horizontal extent compared to its thickness. The remaining members are submerged but near the water surface so that they are located within the top portion of the wave where the major portion of the wave kinetic energy is encountered. The buoyant members move vertically within the water and out of phase with each other so that water between them is placed under a compressive force thereby reducing the vertical wave velocity component and accelerating the horizontal wave velocity component to form a reflected wave and a transmitted wave. The reflected wave reduces the kinetic energy of other incident waves and the transmitted wave fills in the wave trough of water past the barrier thereby reducing the vertical wave velocity component of the water in the trough.

Keywords: Breakwater, floating; Buoy mooring system



3,848,464

# UNDERWATER MEASURING BUOY SYSTEM

Robert Hans Scheipner, Dusseldorf-Vennhausen; Helmut Schlusser, Holzbutgen, and Raimund Germershausen, Kaarst, all of Germany, assignors to Firma Rheinmetall GmbH, Dusseldorf, Germany

Filed Mar. 7, 1973, Ser. No. 338,969

Claims priority, application Germany, Mar. 9, 1972, 2211333

Int. Cl. G01d 1/00; B63b 21/52

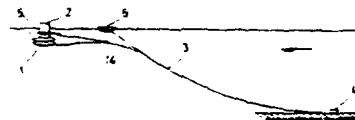
U.S. Cl. 73-170 A

7 Claims

An auxiliary device to be applied under water for the determination of physical or chemical characteristics in waters, which comprises a measuring buoy-system. A device for retaining floating in a predetermined immersion depth the measuring buoy-system. The latter comprises a plurality of cylindrical and prismatic cells, respectively, jointed to a unit, for reception of measuring devices.

Keywords: Buoy, instrumented; Buoy mooring system

U.S. Cl. X.R. 9-8R



3,848,682

**FREE-FALL CORER**

John C. Payne, Long Island City, N.Y., assignor to Leslie J. Payne, Arlington, Va., a part interest  
Filed Aug. 29, 1972, Ser. No. 284,567  
Int. Cl. E21b 7/12

U.S. Cl. 175-5

6 Claims

This invention is directed to an apparatus utilized for extracting earth cores from sub-sea formations. In particular, the apparatus may be dropped from a carrier vessel, whereupon it descends as a completely self contained unit to the ocean bottom. After penetration and extrusion by the apparatus in the ocean bottom an automatic condition-responsive device facilitates the extrication of the apparatus from the marine bottom by providing a sufficient buoyant force to lift the apparatus to the ocean surface.

Keywords: Instrument retrieval; Sampler, seabed-driven core

U.S. Cl. X.R. 175-58



NOVEMBER 26, 1974

3,849,989

**INFLATABLE BARRIER FOR SUBSTANCES FLOATING ON WATER**

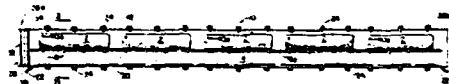
Paul Preus, Box 1002, Toms River, N.J. 08753  
Filed May 25, 1973, Ser. No. 363,954  
Int. Cl. E02b 3/04; 15/04

U.S. Cl. 61-1 F

4 Claims

A floating barrier for substances floating on water having: a series of inflatable chambers, with plural subchambers, disposed in end-to-end relation; a flexible skirt depending from the chambers; and tension members on each side of the barrier.

Keywords: Pollutant, surface barrier



3,849,990

# ANTI-HEAVE PROTECTIVE SYSTEM

Jacques Edouard Lamy, Fontenay-Aux-Roses, France, assignor to C. G. Doris, Compagnie Generale pour les Developpements Operationnels des Richesses Sous-Marines, Paris, France

Filed Jan. 17, 1973, Ser. No. 324,305

Claims priority, application France, Jan. 18, 1972, 72.01560

Int. Cl. E02b 5/06

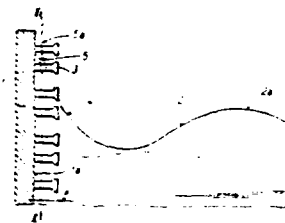
U.S. Cl. 61-3

11 Claims

Anti-heave protective system including especially designed means adapted to slow down ascending and descending water flows against an obstacle exposed to wave and heave action. These means include material elements such as studs, blade portions or a colonnade on which string-courses have been placed, constituting in front of the obstacle, projecting energy dissipating elements over a depth sufficient to penetrate beyond the limit layer of the water mass moving upwards and downwards against the obstacle.

Keywords: Breakwater, concrete; Offshore caisson; Seawall

U.S. Cl. X.R. 61-4; 61-49



3,849,993

# METHOD FOR CONSTRUCTING SEA ICE ISLANDS IN COLD REGIONS

Joel P. Robinson, Los Angeles, and Paul J. Durning, La Habra, both of Calif., assignors to Union Oil Company of California, Los Angeles, Calif.

Filed July 23, 1973, Ser. No. 382,006

Int. Cl. E02b 17/00; F25c 1/02

U.S. Cl. 61-46

10 Claims

A method for constructing sea ice islands in cold regions in which a water impervious membrane is placed on the surface of a floating sheet of natural ice and sea water is thereafter deposited on the membrane and allowed to freeze to form an ice body having a mass such that its draft is greater than the water depth, whereby the ice island is permanently grounded. Brine is drained from the ice body through wells penetrating the upper portion of the ice body above the membrane. Alternatively, sea water can be frozen directly on the surface of the natural ice until the ice sheet is thickened sufficiently that the bottom of the ice is just above the marine floor. The ice body is cured at ambient conditions to allow brine to drain from the bottom of the body. Next, a water impervious membrane is applied to the surface of the ice body and additional sea water frozen thereon to thicken the ice body sufficiently to ground it on the marine floor and to raise the surface of the body above the surrounding floating ice. Brine is drained from the upper portion of the ice body above the impermeable membrane through wells penetrating this portion of the body.

Keywords: Offshore construction; Offshore island; Ice structure

U.S. Cl. X.R. 61-1; 61-36A; 62-1; 62-260



3,849,994

GUIDE BASE AND METHOD FOR SETTING SAME  
Ed O. Seabourn, Norfolk, England, assignor to Phillips Petroleum Company, Bartlesville, Okla.

Filed Sept. 24, 1973, Ser. No. 400,162

Int. Cl. E21b 43/01, B63b 35/00

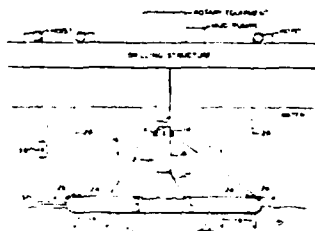
U.S. Cl. 61-46.5

10 Claims

A frame having an opening therethrough is secured by a first means to a drilling means positioned in said opening. A second means is provided for severing a portion of the first means in response to movement of the drilling means through the frame for releasing said drilling means from said frame.

Keywords: Offshore construction; Seabed foundation; Seabed oil, process structure

U.S. Cl. X.R. 61-63; 166-.5; 166-.6; 175-7



3,850,128

VIBRATORY ANCHOR

Jack Lovell, McLean, Va., assignor to Ocean Science and Engineering, Inc., Rockville, Md.

Filed July 16, 1973, Ser. No. 379,707

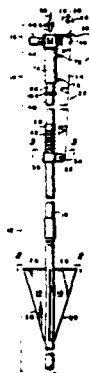
Int. Cl. B63b 21/26

U.S. Cl. 114-206 R

4 Claims

An anchor assembly for embedment into a formation beneath a body of water, comprising an anchor section having an elongated hollow shaft and radially extending tapered plates attached to the lower end thereof, a vibratory drive unit and a releasable coupling for connecting said drive unit to said shaft. The vibratory forces fluidize the sea floor whereby the anchor tends to sink by its own weight. After embedment, the coupling is deactivated to permit retrieval of the drive unit.

Keywords: Embedment anchor





DECEMBER 3, 1974

3,851,476

METHOD AND APPARATUS FOR BREAKING WAVES  
Morgan Llewellyn Edwards, 5933 Corsica Dr., Dayton, Ohio  
45424

Filed Nov. 29, 1972, Ser. No. 310,422  
Int. Cl. E02b 3/04

U.S. Cl. 61-1 R

5 Claims

A platform is supported beneath the surface of a body of water and may be remotely raised or lowered to a height causing waves passing thereover to break. Means are also provided to rotate the platform for further controlling the manner in which the waves break.

Keywords: Breakwater, steel frame; Seabed foundation

U.S. Cl. X.R. 61-4



3,851,477

DEVICE FOR PROTECTING WORKS AGAINST LIQUID  
MASSES

Jean Claude Romain, Paris, France, assignor to Michel Le-  
court; Bernard Grenot, both of Paris, France and Projetud,  
Paris, France

Filed Jan. 31, 1973, Ser. No. 328,283  
Claims priority, application France, Mar. 9, 1972, 72.08174  
Int. Cl. E02b 3/12

U.S. Cl. 61-4

4 Claims

This block for protecting fixed or floating works against the impact of moving liquid masses, for example waves, comprises a pair of convergent elongated elements forming together a kind of bow directed towards the wavefront to be deadened, and one or more complementary elements connected to said bow to constitute seating means for the complete block. The free ends of these elements are provided with protrusions or the like, preferably of substantially frustoconical configuration, for interlocking the blocks disposed in any suitable order or arrangement.

Keywords: Concrete armor unit

U.S. Cl. X.R. 61-37



3,851,482  
SECTIONALIZED LEG FOR DRILLING PLATFORM AND  
METHOD OF ASSEMBLING SAME

Richard L. LeTourneau, and Chester G. Hall, both of Longview, Tex., assignors to IHC Holland-Le Tourneau Marine Corporation, Kilgore, Tex.

Filed May 25, 1973, Ser. No. 363,987  
Int. Cl. E02b 17/00

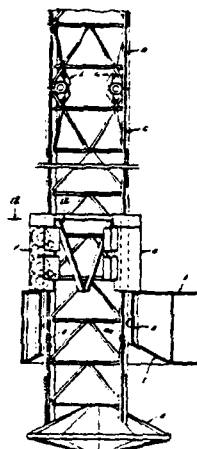
U.S. Cl. 61-46.5

11 Claims

A leg or spud structure for a jack-up-type offshore drilling platform has longitudinally separable sections of triangular or other polygonal cross-section, including longitudinal corner chords one or more carrying driving means. Joint structures separably secure together the pairs of abutting chords with the mating rack sections accurately aligned and timed.

Keywords: Offshore platform, jack up;  
Offshore platform, leg

U.S. Cl. X.R. 52-123; 52-637; 403-368



3,851,490  
CONSTRUCTION PILE HAVING FLUID INJECTION  
MEANS

Kunijiro Matsushita, Toyokawa, Japan, assignor to Kumagai Gumi Company Limited, Fukui-shi, Japan

Filed Apr. 4, 1973, Ser. No. 347,977

Claims priority, application Japan, July 28, 1972, 47-76256  
Int. Cl. E02d 7/24; E21b 7/18

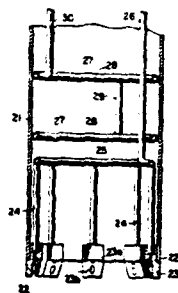
U.S. Cl. 61-53.74

2 Claims

A construction pile comprising a hollow cylindrical body. First fluid spray nozzle means including a plurality of radially inwardly and downwardly directed nozzle openings provided at one end of said body, conduit means provided in said body for supplying water under pressure to said first nozzle means, second nozzle means provided in said body and including a plurality of radially inwardly directed nozzle openings, and conduit means provided in said body for supplying pressurized air to said second nozzle means, whereby the pile can be driven into earth by discharging water under pressure through said first nozzle means to form a bore through which the pile can be advanced with a minimum resistance, and simultaneously discharging pressurized air through said second nozzle means to agitate fluid entrapped in said pile so as to prevent the interior of the pile from being clogged by soil.

Keywords: Pile driver, water jet; Pile, steel

U.S. Cl. X.R. 175-67



3,851,492  
**APPARATUS AND METHOD FOR OFFSHORE  
 OPERATIONS**

Glenn E. Cannon; James R. Kruger; Theodore A. Short, and  
 Benjamin L. Jobe, all of Houston, Tex., assignors to Seascope  
 Services, Inc., Houston, Tex.

Continuation of Ser. No. 184,728, Sept. 29, 1971, abandoned.

This application May 18, 1973, Ser. No. 361,810

Int. Cl. F16I 1/00

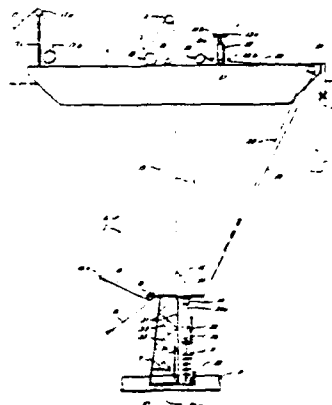
U.S. Cl. 61-69 R

20 Claims

A new and improved system, apparatus and method for performing operations on the floor of the sea or other underwater locations utilizes a combination of tension devices for maintaining work bodies in desired positions while also permitting viewing of such underwater operations by remote control television camera or other operations.

Keywords: Embedment anchor; Seabed pipeline placement; Seabed trencher

U.S. Cl. X.R. 61-72.3



3,852,705  
**SONAR DEPTH TRACKING SYSTEM**

William R. Backman, Jr., Portsmouth, and George M. Walsh,  
 Middletown, both of R.I., assignors to Raytheon Company,  
 Lexington, Mass., by said George M. Walsh

Continuation of Ser. No. 146,729, May 25, 1974, abandoned.

This application Mar. 26, 1973, Ser. No. 345,026

Int. Cl. G01s 9/68, 7/66

U.S. Cl. 340-3 R

22 Claims

A system, selectively responsive to the first, peak, or last portion of a radiant energy signal for displaying a gate which brackets the radiant energy signal and also provides means for inhibiting the generation of such signal during a preset time interval preceding the gate. Means are also provided for automatically widening the gate and repositioning the gate to insure tracking of the radiant energy signal. The system is particularly adapted for monitoring a sonar depth recording to provide audible and visual alarms when the sonar data becomes excessively noisy and during sudden changes in the water depth.

Keywords: Sonar, depth sounder

U.S. Cl. X.R. 343-7.3



3,852,708  
MULTIPLE ELEMENT PHASED ARRAY WITH SHADED  
SUB-ELEMENT GROUPS

Richard D. Doolittle, Washington, D.C., and John A. Dorr,  
Crofton, Md., assignors to Chesapeake Instrument Corpora-  
tion, Shady Side, Md.

Filed Jan. 24, 1972, Ser. No. 219,939  
Int. Cl. G01v 1/38

U.S. Cl. 340-7 R

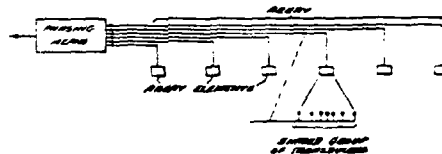
19 Claims

An array of grouped transducer elements (i.e., groups of sub-elements with each group connected together in parallel to act as a single array element) is disclosed for use in a towed hydrophone array where the wavelength of unwanted noise signals has been discovered to be much shorter than the wavelength of signals for which a response is desired. In such a towed array, each group of sub-elements itself acts as an array with respect to the shorter wave length tow noise signals and improved performance of the overall (i.e., greater signal-to-noise ratio) composite array of elements is achieved by shading individual groups of sub-elements to minimize their responses to the unwanted noise signals. The exemplary embodiment is directed to a linear towed array of hydrophones intended for use in liquid mediums. When such an array is towed through the liquid medium, it has been discovered that so-called "tow noise" is generated and propagated mechanically along the physical structure of the array at a relatively low velocity whereas the acoustic waves travelling in the liquid medium (for which a response is actually desired) travel at a much higher velocity and therefore have a correspondingly greater wave-

Keywords: Seismic hydrophone array;  
Seismic streamer cable

U.S. Cl. X.R. 340-6R; 340-15.5CF

length. Thus, a single group of sub-element hydrophones connected together may act as only a single element with respect to the longer wavelength acoustic waves of interest while at the same time the group will act as an array with respect to the tow noise propagating axially along the towed linear array. Accordingly, each group of transducers is shaded either by physical spacing and/or by proportioned hydrophone sensitivities etc., to result in minimizing the end-fire responses of the groups for the unwanted tow noise signal.



DECEMBER 10, 1974

3,852,964  
FLOATING ANTI-POLLUTION DEVICE  
Louis Ballu, Epernay, France, assignor to Kleber-Colombes,  
Paris, France

Filed July 14, 1972, Ser. No. 271,825  
Claims priority, application France, July 15, 1971,  
71.26043

Int. Cl. E02b 15/04, 3/06  
U.S. Cl. 61-1 F

18 Claims

A floating anti-pollution device such as a barrage or barrier which is intended to stop materials and bodies floating on the surface of water and which includes a skirt provided with suitable ballast supported by float elements; means are provided to permit a change in the height of the skirt in such a manner as to vary the draught of the device.

Keywords: Pollutant debris; Pollutant,  
surface barrier

U.S. Cl. X.R. 61-5



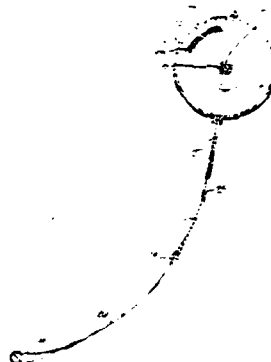
3,852,965  
FLOTATION TYPE WATER SWEEP BOOM AND  
METHODS

Chris H. Rudd, 824 Luton Dr., Glendale, Calif. 91206  
Continuation of Ser. No. 207,187, Dec. 13, 1971, abandoned.  
This application Oct. 31, 1973, Ser. No. 411,277  
Int. Cl. E02b 15/04

U.S. Cl. 61-1 F 20 Claims

A floating boom apparatus adapted to collect floating material and elements, such as oil, in water by being towed laterally through the water from each end of the boom wherein a curtain extends downwardly in the water from a floating surface barrier with the upper portion of the curtain being impervious and the lower portion being open for the passage of water therethrough. The boom is towed by two lines, one extending through the floating surface barrier and the other connected along the lower extremity of the curtain, and the lower line is pulled in advance of the upper line.

Keywords: Pollutant collection; Pollutant, surface barrier



3,852,968  
TORSION-MODE BREASTING DOLPHIN

Myle J. Holley, Jr., 1367 Massachusetts Ave., Lexington, Mass. 02173

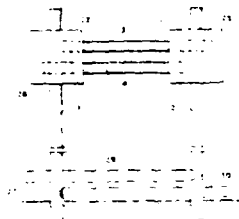
Filed Nov. 19, 1973, Ser. No. 417,326  
Int. Cl. E02b 3/22

U.S. Cl. 61-46 16 Claims

A breasting dolphin is provided wherein a significant portion of ship docking forces are absorbed by torsion in individual piles of the dolphin. Torque arms secured to each of the piles and extending horizontally therefrom receive the initial force of an impacting ship and apply this force to torsion loading of the piles. The outer ends of the torque arms are spaced from and extend beyond companion piles so that unusually heavy horizontal loads cause the outer ends to contact respective companion piles, exerting thereafter a bending moment on both the contacted pile and the pile to which the torque arm is attached.

Keywords: Pile dolphin; Pile, steel

U.S. Cl. X.R. 61-48



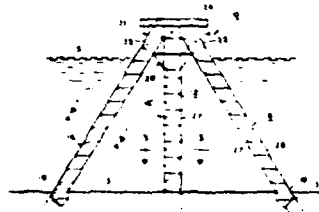
3,852,969  
OFFSHORE PLATFORM STRUCTURES

Robert G. Gibson, and Samuel C. Carruba, both of Houston, Tex., assignors to Fluor Corporation, Los Angeles, Calif.  
Filed May 4, 1973, Ser. No. 357,446  
Int. Cl. E02b 17/00

U.S. Cl. 61-46.5 6 Claims

This invention relates to the construction of offshore platforms on selected sites on the sea floor. The method includes transporting to the site at least one center column and at least three batter columns, erecting the center column so that its upper end extends above the water's surface and its lower end is fixedly secured to the sea floor, and then erecting the batter columns around the center column in bracing relation to the center column and to each other thereby forming a support structure, and constructing a working platform on the erected support structure.

Keywords: Offshore construction; Offshore platform, fixed; Offshore platform, leg



3,852,971

PILE STRUCTURE

Lindsey J. Phares, Sugar Land, Tex., assignor to Raymond International, Inc., Houston, Tex.

Filed July 12, 1973, Ser. No. 378,417

Int. Cl. E02d 5/62

U.S. Cl. 61-53.58

17 Claims

Keywords: Grouting; Pile-driving shoe; Pile, steel

U.S. Cl. X.R. 61-41; 61-53.74

This invention relates to a pile structure and the method of forming a pile structure in situ which includes a pile having an annularly shaped band portion mounted adjacent the lower end thereof that supports an annular manifold on its upper surface, the manifold having a plurality of spaced upwardly directed nozzles. Grout tubes extend from near the top end of the pile downwardly adjacent the pile walls to the manifold. When the pile is driven into the earth, grout is simultaneously forced through the grout tubes into the manifold and upwardly out through the plurality of nozzles to completely fill the annular space between the walls of the pile and the adjacent earth. Upon completion of the driving operation, the flow of grout is terminated and the grout is allowed to set-up and form a bonded interface between the pile and the adjacent earth.



3,852,972

SUBMERGED PIPELINE BURIAL APPARATUS

Robert Holberg, 608 W. Bough Ln., Houston, Tex. 77024

Filed May 17, 1973, Ser. No. 361,151

Int. Cl. E02f 5/06

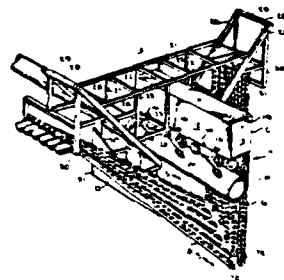
U.S. Cl. 61-72.4

7 Claims

Keywords: Seabed pipeline placement; Seabed trencher

U.S. Cl. X.R. 37-62

The present invention includes a submerged pipeline burial apparatus comprising a support structure carried along the pipeline by a movable carriage and a plurality of inclined augers supported by the structure with their forward ends beneath the pipe and their rear ends above the pipe for cutting or digging bottom material from beneath the pipe to form a trench in which the pipe is buried. The undercut material is deposited on the bottom adjacent the trench where water currents and wave motion will subsequently fill the trench to cover the pipeline.



3,852,997

**METHOD AND APPARATUS FOR MONITORING  
POLLUTION OF NATURAL WATERS**

Robert Horvath, Plymouth, Mich., assignor to Environmental  
Research Institute of Michigan, Ann Arbor, Mich.

Filed Feb. 9, 1973, Ser. No. 331,300

Int. Cl. G01n 25/00

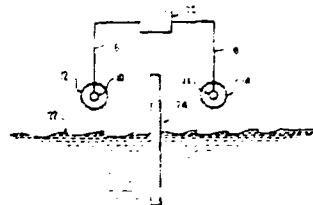
U.S. Cl. 73-61.1 R

14 Claims

Wet bulb temperature readings are used to determine the presence of pollutants which differ significantly in evaporative rate from that of the natural water which they pollute. Liquid from a portion of the natural water which may become polluted is used to wet one temperature sensor while natural water which cannot simultaneously be polluted is used to wet another temperature sensor. The wet bulb temperatures of the two sensors are compared to determine the presence of pollutant.

**Keywords: Pollutant measurement**

U.S. Cl. X.R. 73-61.3



3,853,084

**DOCK AND WHARF FENDERS**

Mordecai Kedar, 34 Kafrisin St., Tel Baruch, Israel

Filed May 25, 1973, Ser. No. 364,118

Claims priority, application Israel, May 26, 1972, 39555

Int. Cl. E02b 3/22

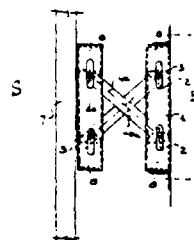
U.S. Cl. 114-219

3 Claims

The present invention relates to dock and wharf fenders comprising scissor-like moving pairs of lever members which are connected, at a common point, hingedly to a wale, the opposite ends of each pair being connected in spaced relationship to one another to a longitudinal member which is adapted to be fixedly attached to the dock wall, these spaced ends of the pair of levers being slidingly connected with the longitudinal member and acting against rubber buffers provided within or on the longitudinal member.

**Keywords: Pier fender**

U.S. Cl. X.R. 61-48



144

DECEMBER 17, 1974

3,854,333  
METHOD FOR DETERMINING DIRECTION AND SPEED  
OF OCEAN CURRENTS  
Joseph D. Richard, 3613 Loquat Ave., Miami, Fla. 33133  
Filed Apr. 25, 1973, Ser. No. 354,368  
Int. Cl. G01d 1/00

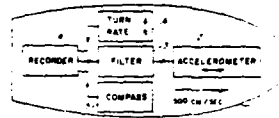
U.S. Cl. 73-170 A

8 Claims

A method for measuring from a moving vessel the speed and direction of ocean currents relative to the earth's surface. A turning maneuver of the measuring vessel within an ocean current results in acceleration changes which are measured and recorded. The vessel's heading and turn rate are also recorded along with a time base. From the recorded information, current direction is determined from the vessel's heading which coincides with a null in the measured acceleration. Current speed is determined from the magnitude of the acceleration signal and the turn rate.

Keywords: Current measurement

U.S. Cl. X.R. 73-189



3,855,152  
PREPARATION OF PERLITE-ASPHALT-FIBER  
COMPOSITIONS FOR SEPARATING HYDROCARBONS  
FROM WATER

Paul Preus, Toms River, N.J. 08753  
Division of Ser. No. 83,640, Oct. 24, 1970, abandoned. This  
application Sept. 28, 1972, Ser. No. 292,886  
Int. Cl. B01j 1/132

U.S. Cl. 252-430

2 Claims

A compound for separating organic liquids, particularly hydrocarbons from an organic liquid-water system including a loose mass of expanded perlite mixed with clays and a fibrous filler formed by demulsifying an aqueous suspension of the compound and comminuting the demulsurized mixture.

The compound is introduced into, or contacted by, the organic liquid-water system to selectively absorb the hydrocarbon whereupon the compound and the hydrocarbon absorbed therein are mechanically separated from the system.

Keywords: Pollutant absorption

U.S. Cl. X.R. 210-36; 210-40; 210-DIG.21;  
252-425.5; 252-427

No Figure



DECEMBER 24, 1974

3,855,809

UNDERWATER OIL STORAGE TANK AND METHOD OF  
SUBMERGING SAME

Randolph E. Westling, Houston, Tex., assignor to Gulf Oil  
Corporation, Pittsburgh, Pa.

Continuation of Ser. No. 152,715, June 14, 1971, abandoned.

This application Aug. 3, 1972, Ser. No. 277,698

Int. Cl. E02b 17/00; B65d 89/10

U.S. Cl. 61-46.5

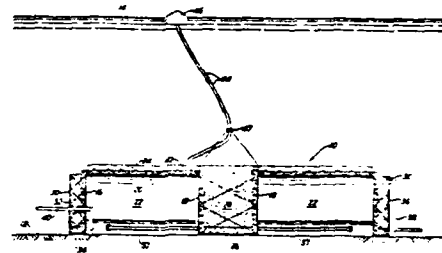
7 Claims

Keywords: Offshore construction; Offshore  
storage tank, submerged

U.S. Cl. X.R. 114-.5T

A submerged tank for location on the sea bottom has upwardly opening ballast chambers. The ballast chambers have a bottom member that rests directly on the sea bottom. The storage tank is open to the entrance of water into the lower portion of the storage compartment of the tank from the surrounding waters whereby pressure within the tank and in the surrounding water is substantially equal. In a preferred embodiment the tank is of annular shape with a central ballast chamber and an outer ballast chamber surrounding the storage compartment.

The tank is filled with a liquid of lower density than sea water to give it sufficient buoyancy to be floated to the desired site and is sunk at the site by displacement of low density liquid with sea water. After location of the tank on the bottom, the ballast compartments are filled with ballast to secure the tank on the sea bottom.



DECEMBER 31, 1974

3,857,247

OFFSHORE TOWER ERECTION TECHNIQUE

Lindsey J. Phares, Sugar Lane, Tex., assignor to Raymond  
International, Inc., Houston, Tex.

Filed Feb. 6, 1974, Ser. No. 440,122

Int. Cl. E02b 17/04; E02d 21/00

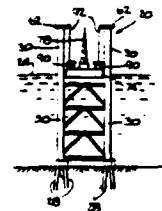
U.S. Cl. 61-46.5

6 Claims

Keywords: Offshore construction; Offshore  
platform, fixed; Pile placement

U.S. Cl. X.R. 61-53.5

An offshore tower is erected by positioning an open framework template on a sea bed; jacking a construction barge up onto the template out of the water, installing anchor piles securing the legs of the template to the sea bed by operations carried out from the raised barge, lowering the barge and thereafter raising a large platform up onto the template.



3,857,248  
**PLATFORM LEVELING DEVICE**  
 Henry A. Rutter, 820 W. 10th, Claremore, Okla. 74017  
 Filed Mar. 8, 1973, Ser. No. 339,277  
 Int. Cl. B63c 5/00

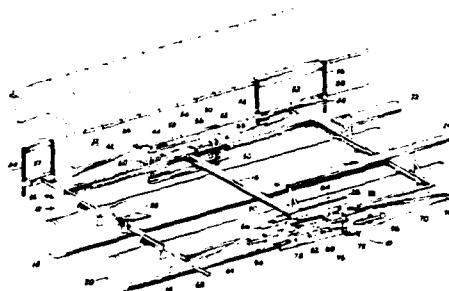
U.S. Cl. 61-65

2 Claims

A platform leveling device for use on apparatuses with hoisting means and the like and comprising platform suspension means for movably attaching the platform to the apparatus, leveling means operably connected between the platform and the suspension means for maintaining a constant attitude of the platform during a hoisting operation regardless of the load distribution on the said platform.

Keywords: Small-craft service structure

U.S. Cl. X.R. 61-48; 61-67; 114-45; 214-1A



3,857,250  
**UNDERWATER VEHICLE FOR LAYING UNDERGROUND CABLES AND PIPELINES**  
 Vincenzo Di Tella, Capella di Torre Gaveta, and Adolfo Rodighiero, Venezia, both of Italy, assignors to Tecnomare S.p.A., Venezia, Italy  
 Filed Apr. 4, 1973, Ser. No. 347,542  
 Claims priority, application Italy, Apr. 7, 1972, 22855/72  
 Int. Cl. E02f 5/06

U.S. Cl. 61-72.4

6 Claims

A self-powered submergence vehicle is provided with digging tools for entrenching previously laid pipelines on the like. Movement of the vehicle is controlled through the sensing of the position of the pipeline so that deviations in the movement of the vehicle relative to the pipeline are automatically compensated for.

Keywords: Seabed pipeline placement; Seabed trencher



3,857,651  
**PUMPING UNITS FOR CYCLONIC ELEVATOR**  
 Anthony I. Bruno, 4333 Dawson Ave., San Diego, Calif. 92115  
 Continuation of Ser. No. 155,750, June 23, 1971, abandoned.  
 This application July 26, 1973, Ser. No. 382,823  
 Int. Cl. F04f 5/42

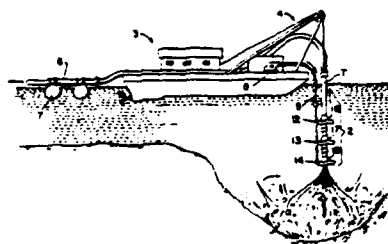
U.S. Cl. 417-171

5 Claims

Coaxial pumping units for cylindrical cyclonic elevator tubes in which a manifold circumscribing the latter for supplying fluid under pressure thereto has communication therewith via an annular transition ring provided with a plurality of circumferentially spaced jet orifices set at inwardly and circumferentially directed compound angles for ejecting vortically directed jets of fluid under pressure through the tubular elevator to effect transportation of comminuted and/or fluid material through such tubes.

Keywords: Dredge, cutterhead; Dredge, suction; Dredge intake; Pump

U.S. Cl. X.R. 37-61; 302-15; 302-58; 417-163



2. 1975

3,858,402 to 3,930,168

JANUARY 7, 1975

3,858,402

#### OIL STORAGE TERMINALS

Rowland Baker, Somerset, and Gordon Norton, Epping, both of England, assignors to The Balaeva Group Limited (formerly Seaward Structures International), Cambridge, England

Filed Jan. 17, 1973, Ser. No. 324,303

Claims priority, application Great Britain, Jan. 18, 1972, 2294/72

Int. Cl. B65g 5/00; B63b 35/00

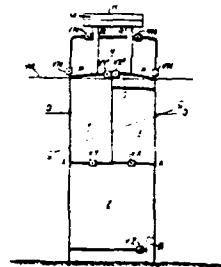
U.S. Cl. 61-46.5

6 Claims

A method of and terminal structure for oil storage at sea are characterised in that the structure is constructed as an elongated closed vessel, internally subdivided into separate compartments which have flooding valves enabling the structure to float like a ship for towing to its site of use, and then to be flooded sequentially with sea water to cause the vessel to tip to a vertical attitude and settle on the sea bed, being grounded by its own weight. Oil is stored in the compartments with concomitant displacement of sea water, and the vessel can be exhausted of liquid and refloated for removal if desired.

Keywords: Offshore storage tank, emergent

U.S. Cl. X.R. 114-5T; 220-18



JANUARY 14, 1975

3,859,796

#### SUBMERSIBLE OIL BOOM

Robert A. Benson, Cohasset, Mass., assignor to Submarine Engineering Associates, Inc., Cohasset, Mass.

Continuation-in-part of Ser. No. 222,867, Feb. 2, 1972, Pat. No. 3,818,708. This application Mar. 27, 1974, Ser. No. 455,198

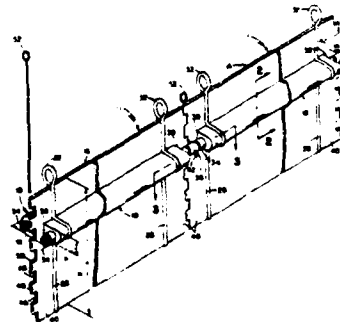
Int. Cl. E02b 15/04

U.S. Cl. 61-1 F

16 Claims

A submersible oil barrier or boom capable of enclosing an area of water surface, said barrier being made up of sections each comprising a solid vertical dam and substantially continuous flotation elements extending laterally from opposite sides of the dam, the barrier being submersible, that is, selectively floatable and sinkable so that the barrier may be sunk for passage of an oil tanker or the like thereover and subsequently again floated to enclose an area including such tanker for confining oil spills.

Keywords: Pollutant, surface barrier



3,859,797  
OIL BOOM

Ray R. Ayers, Houston, Tex., assignor to Shell Oil Company, Houston, Tex.

Continuation of Ser. No. 95,649, Dec. 7, 1970, abandoned.  
This application Sept. 26, 1972, Ser. No. 292,388

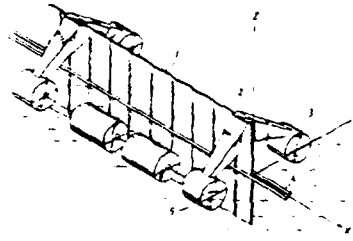
Int. Cl. E02b 15/04

U.S. Cl. 61-1 F

2 Claims

Apparatus and method for controlling the spill of a polluting liquid on a water surface, the apparatus being composed of a vertical skirt of corrugated material supported at intervals along the length of the skirt by outriggers which function to support the skirt by floats held spaced from the skirt; the method involving uncoiling a skirt of corrugated material, attaching outrigger connected floats at intervals along the length of the skirt, and deploying the skirt, outriggers and floats into the water around the pollutant spill.

Keywords: Pollutant, surface barrier



3,859,803

ANTI-SCOUR MEANS FOR SUBMARINE STRUCTURES  
Kristen I. Pedersen, Scarsdale, and William F. Cavanaugh, Rockville Center, both of N.Y., assignors to Sofec Inc., Houston, Tex.

Filed Dec. 17, 1973, Ser. No. 425,229

Int. Cl. E02d 29/00

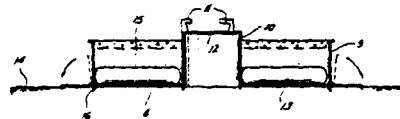
U.S. Cl. 61-46

10 Claims

An anti-scour skirt is pivotally secured to a structure installed on the sea floor or a water bottom so as normally to extend outwardly from the structure and rest on the sea or stream bottom for preventing scouring or washing by water action of sand and other bottom material from around and beneath the structure. The skirt structure is circumferentially deformable so that it can be pivoted upwardly to a compact position adjacent the structure to facilitate transport through the water.

Keywords: Seabed foundation; Seabed scour protection

U.S. Cl. X.R. 61-1R



3,859,806

OFFSHORE PLATFORM

Arthur L. Guy, Houston, Tex., and John B. Reber, Jr., Sabah, Malaysia, assignors to Exxon Production Research Company, Houston, Tex.

Continuation-in-part of Ser. No. 286,374, Sept. 5, 1972, abandoned. This application Oct. 1, 1973, Ser. No. 402,661

Int. Cl. E02d 21/00; B63b 35/40

U.S. Cl. 61-46.5

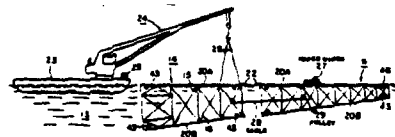
14 Claims

A method for joining two or more jacket or substructure components of an offshore platform in the water to form a single jacket unit. An offshore platform is located in deep water by dividing a jacket or support of extensive length therefor into at least two sections which have only sufficient buoyancy to float at water surface when the sections are launched from at least a vessel at a selected location. The sections are aligned and connected together. Guide means ensure proper alignment of the legs of the sections. Access tubes from the surface of the water to the hollow legs permit direct internal welding in securing the legs of the sections together. The sections are then sunk at the selected location until the jacket is in an upright position

Keywords: Offshore construction; Offshore platform, fixed

U.S. Cl. X.R. 114-77; 285-286

at which point it is anchored by driving piling through the jacket's hollow legs into the sea floor, following which the deck of the platform is placed or stabbed on the anchored jacket.



3,859,949

**ENVELOPE FOR UNDERWATER CABLE, DRAG ROPES  
OR THE LIKE**

Dietrich Toussaint, and Frank Meyer, both of Bremen, Germany, assignors to Vereinigte Flugtechnische Werke-Fokker Gesellschaft mit beschränkter Haftung, Bremen, Germany  
Filed Sept. 28, 1972, Ser. No. 292,917

Claims priority, application Germany, Oct. 5, 1971, 2149592

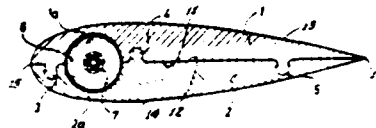
Int. Cl. B63b 21/00

U.S. Cl. 114—235 F

12 Claims

Cable and drag rope jackets are constructed from snapped together strips having streamline profile, and joints only at the leading and trailing edges of the profile. Each strip has recesses which mutually cover each other upon assembly to receive one or more cables or a rope.

Keywords: Towing cable



3,860,519

**OIL SLICK SKIMMER**

Danny J. Weatherford, 7250 N. 41st Ave., Phoenix, Ariz. 85021

Filed Jan. 5, 1973, Ser. No. 321,281

Int. Cl. E02b 15/04

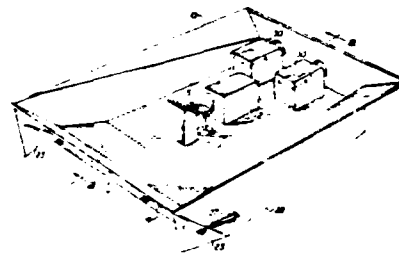
U.S. Cl. 210—242

3 Claims

A boat or barge with hull appendage for skimming oil slicks or other pollutants from bodies of water and related equipment for facilitating the oil-water separating function.

Keywords: Pollutant removal watercraft;  
Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.21



3,860,899

**STRUM NOISE REDUCING DEVICE**

Francis W. Watlington, Coralita Pembroke, Bermuda, assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Oct. 8, 1968, Ser. No. 766,382

Int. Cl. G01s 7/66

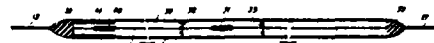
U.S. Cl. 340—3 T

6 Claims

A device for reducing noise in a towed hydrophone system caused by cable strum is provided by producing a signal that is proportional to the strum signal but is uninfluenced by the acoustic signal. A geophone, an accelerometer or a strain gauge may be suitably positioned to be sensitive only to the distortion caused by cable strum. The strum signal thus detected is introduced in opposition to the combined acoustic and strum signal received by the hydrophone so that strum noise in the acoustic signal is erased or substantially deleted.

Keywords: Seismic hydrophone; Towing cable

U.S. Cl. X.R. 340-7R



(5)

JANUARY 21, 1975

3,860,987

**DEVICE FOR APPLYING A PROTECTIVE COATING TO  
AN IMMERGED SURFACE**

Peter Bolli, and Jean-Jacques Asper, both of Geneva, Switzerland, assignors to Battelle Memorial Institute, Carouge, Switzerland

Filed May 8, 1973, Ser. No. 358,343

Claims priority, application Switzerland, May 10, 1972, 7009/72

Int. Cl. A46b 13/04

U.S. Cl. 15—29

6 Claims

A coating applicator for the painting of underwater surfaces comprises a rotary brush whose hollow body, mounted on the shaft of a driven motor, has a chamber communicating with a source of paint under pressure. A bunch of bristles on the brush body is supplied with paint from the chamber via flexible tubes terminating just short of the bristle tips. A peripheral array of relatively hard bristles may receive another reagent, e.g., a solvent, from a separate compartment of the brush body while an inner core of harder bristles is supplied with paint.

Keywords: Coating; Structure repair

U.S. Cl. X.R. 15-50R; 15-180; 117-111C; 118-200



3,861,157

**APPARATUS FOR DEPOSITING UNDER WATER A  
FLOWABLE HARDENABLE OR NOT HARDENABLE  
MASS**

Henri Fredericus Josephus Marie Hillen, The Hague, Netherlands, assignor to Foundation Patent & Investment Company, N.V., Gonda, Netherlands

Filed Mar. 1, 1973, Ser. No. 336,994

Claims priority, application Netherlands, Mar. 1, 1972, 7202734

Int. Cl. E02b 1/00, 3/12

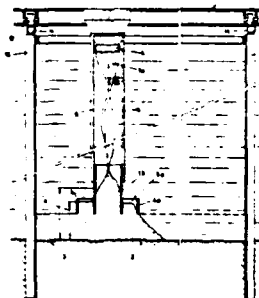
U.S. Cl. 61—63

4 Claims

Apparatus for providing under water a flowable, hardenable or not hardenable mass, such as (concrete) mortar, asphaltic bitumen and the like, is provided with a pouring tube depending from a carrier structure and having a filling device, wherein the pouring tube is surrounded at its outflow end by at least one short sleeve defining therewith an intermediate space.

Keywords: Asphalt; Concrete form; Seabed material placement

U.S. Cl. X.R. 61-46; 61-53.6



3,861,158

# SUBMERGED PIPELINE STABILIZATION

Jack W. Swain, Bedford; Clarence T. Thomerson, and Tom C. Waldrop, both of Arlington, all of Tex., assignors to Regal Tool & Rubber Co. Inc., Grapevine, Tex.

Filed Feb. 7, 1973, Ser. No. 330,396

Int. Cl. E02d 27/46, 27/52; F16l 1/00

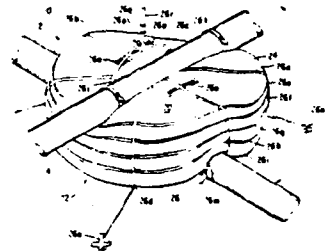
U.S. Cl. 61-72.1

11 Claims

A submerged pipeline stabilizer in which an elastomeric casing structure has a saddle enveloping a portion of the pipeline and means to introduce a setttable cement into said casing at least in part to control the shape of said stabilizer.

Keywords: Concrete form; Sandbag; Seabed foundation; Seabed pipeline placement

U.S. Cl. X.R. 61-50; 138-106; 138-112; 248-49; 248-358



3,861,211

# ULTRA-LOW FLOW VELOCITY CURRENT METER

Rajinder N. Dewan, Suitland, Md., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Mar. 25, 1974, Ser. No. 454,504

Int. Cl. G01f 1/00

U.S. Cl. 73-194 A

4 Claims

This invention relates to the use of an acoustic signal to determine current velocity of water. The device makes use of a centrally single positioned transducer with four equispaced receivers equidistant from the transducer. A carrier frequency with two different modulator frequencies are directed to the transducer and the receivers receive the transmitted pulses through the water current. The velocity of the water is determined by measuring the phase angle of the different signals that pass through the water and which are received by the receivers. The different signals permits one to determine the velocity of the water.

Keywords: Current measurement

U.S. Cl. X.R. 73-170A



3,861,340  
FLOATING DOCK STRUCTURE

Jerry L. Clingenpeel, Rt. 3, Box 2038-31A, Port Richey, Fla. 33568

Filed Feb. 22, 1973, Ser. No. 334,580  
Int. Cl. B63b 35/34

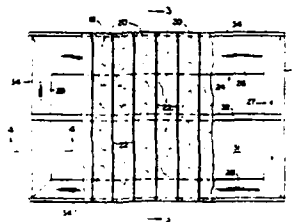
U.S. Cl. 114—5 F

8 Claims

A marine structure in the form of a dock which is free floating in the water and which comprises a main deck area mounted in supported relation to a plurality of floating elements arranged in a rectangular or predetermined configuration depending upon the shape of the deck wherein the floating elements are formed from a core of material having a specific gravity less than water, such as foam. An outer protective shell or coating such as fiberglass is arranged on the outer surfaces of the floating element so as to protect them from the environment. At least one of the floating elements is dimensioned to be larger and arranged in predetermined orientation relative to the remaining floating elements to compensate for additional loads placed on the dock such as ramps. The deck is directly connected to a plurality of slats arranged in spaced relation to one another and mounted on the floating elements in interconnecting relation between the deck and floating elements.

Keywords: Pier, floating; Small-craft pier

U.S. Cl. X.R. 9-6



3,861,949  
ARTICLE HAVING APPLIED TO THE SURFACE  
THEREOF, AN ANTI-FOULING COMPOSITION  
COMPRISING A POLYMER AND AN ORGANO-TIN  
COMPOUND

Mitsuo Onozuka, Yasuo Hayashi, and Yoshiaki Adachi, all of Iwaki, Japan, assignors to Kureha Kagaku Kogyo Kabushiki Kaisha, Tokyo, Japan

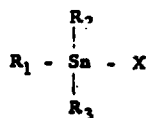
Filed Apr. 27, 1972, Ser. No. 248,270

Claims priority, application Japan, Apr. 27, 1971, 46-27158; Nov. 1, 1971, 46-86263; Dec. 27, 1971, 46-10548  
Int. Cl. B32b 27/06

U.S. Cl. 117—138.5

11 Claims

In an article to be used in or under water and in constant contact with the water, at least the surface of the article is composed of an anti-fouling composition which comprises a polymer and an organo tin compound of the formula:



wherein R<sub>1</sub> is n-dodecyl and R<sub>2</sub> and R<sub>3</sub> are methyl.

Keywords: Coating; Fouling prevention

U.S. Cl. X.R. 106-15AF; 117-138.8E;  
260-45.75K; 260-429.7; 424-288

No Figure



JANUARY 28, 1975

3,862,537

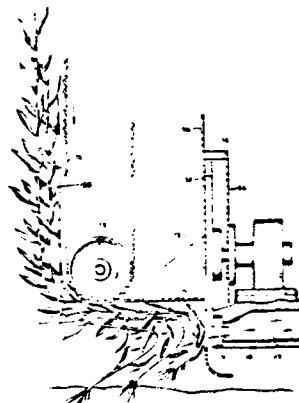
MECHANICAL ELIMINATION OF AQUATIC GROWTHS  
Merle P. Chaplin, 609 Driver Ave., Winter Park, Fla. 32789  
Filed May 29, 1973, Ser. No. 364,283  
Int. Cl. A01d 45/08

U.S. Cl. 56-9

28 Claims

Apparatus and method for eliminating upstanding, floating and other aquatic growths from lakes, rivers and streams, including much of their root structure, comprising mechanically moving the upstanding and floating aquatic growths generally downward to a zone automatically controlled as to its position relative to the root structure of the growths, where suction is applied to draw the growths and roots through a cutting zone where the growths and roots are cut into short pieces, and into a vacuum chamber where entrained air and growths juices are removed from their stems and leaves, and the growths structure collapsed. The cut and collapsed growths and roots may then be subjected to a second cutting operation, with or without pressure, to further destroy their growth identity, and reduce the growths and roots to a finely divided inert mass, which may then be spread as a blanket on the water bottom from which the growths and roots were originally removed, or delivered to a remote location.

Keywords: Pollutant removal watercraft;  
Pollutant, suction removal;  
Water plant removal



3,862,902

DEVICE FOR RECEIVING WATER SURFACE FLOATING IMPURITIES

Abram Yakovlevich Derzhavets, prospekt Gagarina, 4, kv. 5;  
Petr Grigorievich Kogan, ulitsa Perekopskoi divizii, 2, kv. 14, and Sergei Martynovich Nunuparov, ulitsa Lastochkina 5, kv. 34, all of Odessa, U.S.S.R.  
Filed June 6, 1973, Ser. No. 367,396  
Int. Cl. B01d 33/00

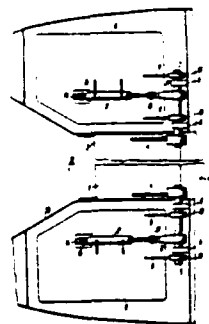
U.S. Cl. 210-122

4 Claims

A device for receiving water surface floating impurities in the collecting receptacle of an oil and garbage skimmer craft comprises a gate installed at the inlet to the collecting receptacle. The upper horizontal edge of the gate forms a weir above which the upper layer of water together with floating impurities is overflowing. The gate is rigidly connected to a float, whereas both the gate and the float are fixed with a possibility for free rocking around a horizontal axis, thus providing for a constant depth of immersion of the upper horizontal edge of the gate in relation to the water level in a basin being cleaned. The gate has an outside surface facing a water basin being cleaned and is given the shape of a portion of a cylinder whose axis coincides with a horizontal axis around which the gate and the float are rocking.

Keywords: Pollutant collection; Pollutant removal watercraft

U.S. Cl. X.R. 210-DIG.21; 210-128; 210-242



3,862,904

**BOAT FOR COLLECTING OIL SLICKS AND OTHER CONTAMINANTS FROM THE SURFACE OF WATER**

Danny J. Weatherford, 7250 North 41st. Ave., Phoenix, Ariz. 85021

Filed Jan. 21, 1974, Ser. No. 435,103  
Int. Cl. E02b 15/04

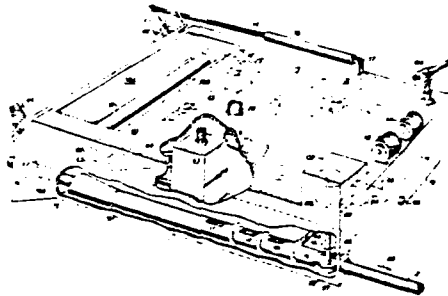
U.S. Cl. 210-242

13 Claims

A boat for collecting oil slicks and other contaminants from the surface of the water including boom means for drawing into the hull of the boat oil slicks and other contaminants which are processed and discharged to a floating appendage for storage purposes.

**Keywords:** Pollutant collection; Pollutant debris; Pollutant removal watercraft; Pollutant, suction removal; Pollutant surface barrier

U.S. Cl. X.R. 210-DIG.21



FEBRUARY 4, 1975

3,863,455

**FLOATABLE BREAKWATER**

Richard Buckminster Fuller, 200 Locust St., Philadelphia, Pa. 19106

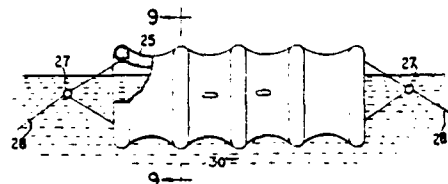
Filed Dec. 10, 1973, Ser. No. 423,006  
Int. Cl. E02b 3/04

U.S. Cl. 61-5

8 Claims

A floatable breakwater comprises a flexible tubular element supported upon a number of water buoyant rings at the surface of the water so that the envelope can be filled with water. Both ends of the envelope are open and have drawstrings attached thereto which in turn are anchored to secure the breakwater in position. The envelope has sufficient flexibility to enable the rings therein to move with respect to each other in an accordion-like movement.

**Keywords:** Breakwater, floating



3,863,456

**METHOD FOR CONSTRUCTING ICE ISLANDS IN COLD REGIONS**

Paul J. Durning, La Habra, Calif., assignor to Union Oil Company of California, Los Angeles, Calif.

Filed July 23, 1973, Ser. No. 381,869  
Int. Cl. E02b 3/00, F25c 1/02

U.S. Cl. 61-46

10 Claims

A method for constructing ice islands in cold regions in which water is placed on the surface of a floating sheet of natural ice and allowed to freeze to form an ice body having a mass such that its draft is greater than the water depth, whereby the ice island is permanently grounded.

**Keywords:** Offshore construction; Offshore island; Ice structure

U.S. Cl. X.R. 61-1R; 61-36A; 62-259



3,863,589

FENDER SYSTEM

Paul Francois Guienne, Paris, and Jacques Francois Robert Prouhet, Les Clayes-sous-Bois, both of France, assignors to Bertin & Cie, Plaisir, France

Filed June 11, 1973, Ser. No. 368,742

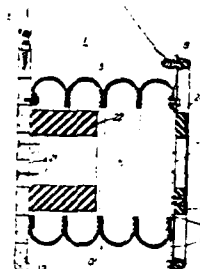
Claims priority, application France, June 14, 1972, 72.21372

Int. Cl. B63b 21/04

U.S. Cl. 114-219

9 Claims

The hull of a ship is maintained at a distance from a quay or the hull of another ship by means of a fender having a deformable chamber whose wall is composed of flexible toric elements. The edges of the latter are tightened between ported flanges having the general shape of the rim of a car wheel and bearing stops for limiting the crushing of the chamber. Alternatively, the crushing limiter stop is a cylindrical sleeve of compressible resilient material fitted to a bottom of the chamber and projecting therein towards the opposite bottom, so as to constitute by itself a permanent backing auxiliary fender.



Keywords: Pier fender

U.S. Cl. X.R. 293-71P; 293-71R

3,863,591

MOORING BAR FOR BOATS

Leo Wild, 2 Secroft Crescent, Downsview, Ontario, Canada

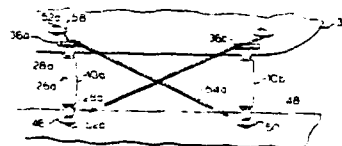
Filed June 9, 1972, Ser. No. 261,257

Int. Cl. B63b 21/00

U.S. Cl. 114-230

10 Claims

A mooring bar for boats, having an elongated central tube, and a ball at each end seated on a plastic cap inserted into the tube. A single or double run of rope passes through the tube, caps and balls, and the ends of the rope are used to tie a boat to a mooring point. The mooring bar thus forms a stiff pivot arm, having a ball joint at each end, between the boat and mooring point. A buoyant plastic foam sleeve wraps the central tube to protect it and to allow use of the mooring bar as a bumper.



Keywords: Small-craft mooring device

U.S. Cl. X.R. 114-219; 267-140

3.864.153

**WATER RESISTING AND ANTICORROSIVE PAINTING  
METHOD AND THE PAINTED ARTICLES**

Satoru Enomoto, Fukushima, Japan, assignor to Kureha  
Kagaku Kogyo K.K., Tokyo, Japan

Continuation-in-part of Ser. No. 68,553, Aug. 31, 1970,  
abandoned. This application Jan. 26, 1973, Ser. No. 326,657  
Claims priority, application Japan, Aug. 30, 1969, 44-68350  
Int. Cl. B32h 15.08

U.S. Cl. 117-75

7 Claims

A painting method which comprises applying to a substrate an undercoating composition comprising from 10 to 500 parts by weight of an alkylated polycyclic aromatic compound containing no nitrogen, oxygen or sulfur to the extent detectable by elementary analysis and having a mean molecular weight measured by the VPO method of from 250 to 600 and an aromatic ring-forming proton density measured by the nuclear magnetic resonance method of from 35 to 80%, and 100 parts by weight of a urethane resin, said undercoating composition further containing a hardening agent and then applying an over-coating composition comprising a curable resin selected from the group consisting of an epoxy resin, a urethane resin, and an alkyd resin.

Keywords: Coating; Corrosion prevention

U.S. Cl. X.R. 117-72; 117-92; 117-135;  
260-33.6UB

No Figure

FEBRUARY 11, 1975

3.864.851

**DREDGE CHAIN, SPROCKET, AND COMBINATION**

Ronald M. Guntert, 2402 Clarendon St., Stockton, Calif.  
95204

Filed Sept. 4, 1973, Ser. No. 393,952  
Int. Cl. E02f 3/14

U.S. Cl. 37-69

15 Claims

A sprocket driven chain of the type having links hingedly connected by pins. The chain includes replaceable, spool-like bushings on the link-connecting pins in which the bushings on the adjacent ends of adjacent pairs of links have arcuate surfaces in substantially 180° contact permitting pendulous lateral movement of the lower portion of a chain relative to the upper portion and to a vertical plane on which said chain is normally supported, and in which plane the links are articulated in movement of the chain around a sprocket. Alternate links of the chain include portions thereon engageable with the teeth of driving sprockets and a tumbler type support is in cooperative relation with alternate links of the chain to augment the driving force of the sprocket teeth. Links on a pair of corresponding parallel, endless chains in spaced opposed relation connected by spacers, cooperate with a pair of chain-supporting sprockets for maintaining the positions of the chains relative to each other where digging buckets are between and connected with the pair of chains, and the chains are disposed in vertical planes for longitudinal movement around the supporting sprockets.

Keywords: Dredge, mechanical

U.S. Cl. X.R. 37-191R; 74-243 DR; 74-246;  
198-151



3,864,920

#### FLOATING BREAKWATER

Sadanori Tazaki, and Yozo Ishida, both of Tokyo, Japan, assignors to Bridgestone Tire Company, Limited, Tokyo, Japan

Filed Sept. 18, 1973, Ser. No. 398,368

Claims priority, application Japan, Sept. 19, 1972, 47-107980; Sept. 30, 1972, 47-113640; May 9, 1972, 47-54312

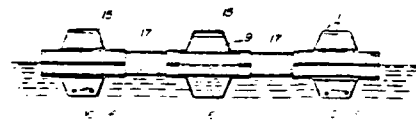
Int. Cl. E02b 3/06

U.S. Cl. 61-5

3 Claims

A floating breakwater in which the floating body is formed by housing a floating material as a floating source and a weighting material as a source for increasing weight in a hollow shell composed of a rigid material and provided with a projection on the upper portion. The specific gravity of the floating body is made to be 0.15 - 0.75 owing to the floating material and the weighting material.

Keywords: Breakwater, floating



3,864,922

#### SEALED CUSHIONING UNIT

Darrell D. Dial, Fort Worth, and Robert J. von Bose, Arlington, both of Tex., assignors to Halliburton Company, Duncan, Okla.

Filed Mar. 22, 1974, Ser. No. 453,980

Int. Cl. E02b 3/22, B61g 9/16

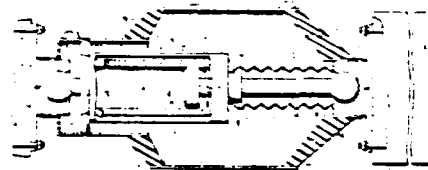
U.S. Cl. 61-48

16 Claims

A method and apparatus for cushioning motion and dissipating impact energy, preferably in a marine environment, including a piston and cylinder assembly, impedance means associated with the piston and cylinder for impeding translation of the piston within the cylinder assembly and an isolation and restoring assembly protectively surrounding the piston and cylinder assembly and continuously biasing the piston and cylinder assembly in a normally extended position operable to dissipate impact energy. The method includes the steps of isolating the piston and cylinder assembly from an ambient environment, cushioning impact forces imparted to the piston and cylinder assembly and restoring the assembly in an extended posture operable to dissipate subsequent impact energy imparted thereto.

Keywords: Pier fender

U.S. Cl. X.R. 114-219; 213-7; 213-8; 213-43; 267-65



3,865,062

# MARINE GEOPHYSICAL EXPLORATION SYSTEM

John J. Babb, Jackson, Miss., assignor to Seiscom Delta Inc., Houston, Tex.

Continuation of Ser. No. 87,831, Nov. 9, 1970, abandoned.

This application July 17, 1972, Ser. No. 272,096

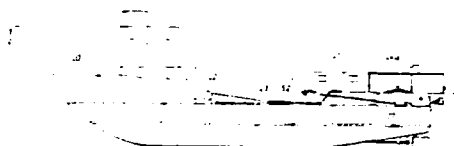
Int. Cl. B63b 35/00

U.S. Cl. 114—43.5

14 Claims

A marine geophysical exploration system includes an ocean going motor vessel and a barge capable of being loaded piggyback on the motor vessel. The barge contains geophysical instrumentation so that when the barge is loaded on the motor vessel, the motor vessel is a fully equipped ocean going geophysical vessel capable of exploring deep water. When the barge is unloaded, it is fully equipped for exploration in shallow water. The system includes facilities for loading and unloading the barge from the motor vessel.

Keywords: Seismic survey method



3,865,722

# CORONA DISCHARGE TREATMENT OF AN OIL SLICK

Patrick C. Stoddard, 7734 Leonard Dr., Falls Church, Va. 22043

Filed Oct. 25, 1972, Ser. No. 300,520

Int. Cl. C02b 9/02

U.S. Cl. 210—42

7 Claims

By subjecting an oil slick freely floating on a water surface to the action of a corona discharge, the oil tends to conglomerate and become cohesive. As a result, removal of the oil from the water surface is facilitated.

Keywords: Pollutant coalescence

U.S. Cl. X.R. 204-185; 210-65; 210-DIG.21



3,865,730

# OIL SPILL CLEANUP

Ray R. Ayers, and Dean P. Hemphill, both of Houston, Tex., assignors to Shell Oil Company, Houston, Tex.

Division of Ser. No. 289,043, Sept. 14, 1972. This application

Dec. 17, 1973, Ser. No. 425,579

Int. Cl. E02b 15/04

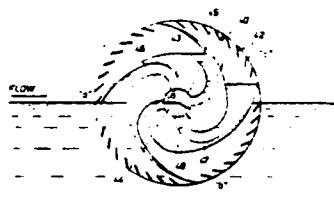
U.S. Cl. 210—242

3 Claims

Method and apparatus for removing oil from the surface of a body of water with a skimmer; the apparatus including a skimmer with baffled entry ports arranged on a plane inclined to the direction of current flow or about the periphery of a drum so that oil enters through the baffles into a chamber which is beneath an inverted funnel or within the axle of the drum; the method involving providing a skimmer having submerged baffle entry ports inclined to the direction of current flow, allowing the oil to enter the skimmer, and returning the skimmer to a horizontal position for removal of the oil therefrom through an inverted funnel suspended over the confined oil.

Keywords: Pollutant, mechanical removal

U.S. Cl. X.R. 210-DIG.21



3.866.161

**METHOD AND APPARATUS FOR OBTAINING A MORE ACCURATE MEASURE OF INPUT SEISMIC ENERGY**

Frederick J. Barr, Jr.; W. Harry Mayne, and Clifford H. Ray,  
all of San Antonio, Tex., assignors to Petty-Ray Geophysical,  
Inc., Houston, Tex.

Filed Jan. 24, 1973, Ser. No. 326,178

Int. Cl. G01v 1/16

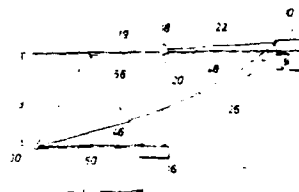
U.S. Cl. 340—15.5 CP

10 Claims

In a number of methods of seismic data analysis an accurate measure of the effective downward-going seismic waveform is required. For example, the effective downward-going seismic waveform is required in certain pulse resolution and deconvolution techniques. The effective downward-going seismic waveform is made up primarily of a composite of the waveform initially downward-going from the seismic source as well as the wave initially upward-going that is reflected from the air-earth or air-water interface. The method described herein is based upon the discovery that there is a "near field effect" which prevents the monitoring by a detector located in the immediate vicinity of the seismic source from being an accurate measure of the composite seismic waveform. Methods are described for converting waveform measurements made in the immediate vicinity of the seismic source to those effective at greater depths as well as for compensating for a similar effect at the reception of the seismic wave by seismic detectors located beneath or at the air-water or air-earth interface.

Keywords: Seismic survey method

U.S. Cl. X.R. 340-7R; 340-15.5MC



FEBRUARY 18, 1975

3.867.630

**SENSOR FOR SUBMERSIBLE PROBES**

Horst Urban, Nordenham, Germany, assignor to Norddeutsche  
Seekabelwerke Aktiengesellschaft, Nordenham, Germany  
Filed July 20, 1972, Ser. No. 273,511

Claims priority, application Germany, Jan. 26, 1972,  
2203475

Int. Cl. G01m 21/22, G02b 5/00

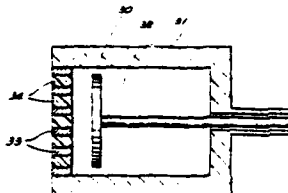
U.S. Cl. 250—239

6 Claims

A sensor body has an outer peripheral exposed surface, and is provided thereon with a plurality of discrete spots on an anti-fouling substance, with each of the spots being separate and spaced from the respective adjacent spots.

Keywords: Fouling prevention; Instrument deployment

U.S. Cl. X.R. 33-DIG.3; 73-170A; 161-6;  
161-36; 161-42; 161-146; 161-196; 161-213;  
250-573; 340-4R; 340-189; 340-190; 350-319



FEBRUARY 25, 1975

3,867,772

METHOD OF EXCAVATING TO FORM OR ENLARGE A  
WATERWAY

Leward N. Smith, 491 Somerset Saginaw, Mich. 48603  
Division of Ser. No. 221,538, Jan. 28, 1972, Pat. No.  
3,777,375. This application July 23, 1973, Ser. No. 381,705  
Int. Cl. E02f 7/28

U.S. Cl. 37-195

5 Claims

A method of forming or enlarging an underwater basin or body of water having an earth bank with chippable material such as brush, roots, and trees growing at the bank wherein earth is dredged from the bank, collected, and removed as an earth-water slurry. The chippable material is reduced to fragments and also introduced to the slurry for removal with the excavated earth.

Keywords: Dredge, cutterhead; Dredge ladder control; Water plant removal

U.S. Cl. X.R. 37-2R; 37-189; 56-9; 144-3D;  
144-34B; 144-309AC; 241-101.7; 271-278R



3,867,817

OIL FENCE HAVING A LIMITED FLEXIBILITY

Kuninori Aramaki; Yasuharu Kawaguchi, both of Yokohama,  
and Hiroshi Kawakami, Kamakura, all of Japan, assignors  
to Bridgestone Tire Company Limited, Tokyo, Japan

Filed June 25, 1973, Ser. No. 373,222

Claims priority, application Japan, June 29, 1972, 47-64431

Int. Cl. E02b 15/04

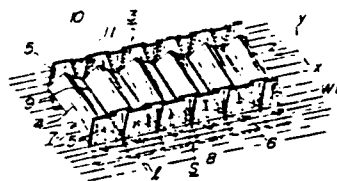
U.S. Cl. 61-1 F

5 Claims

An oil fence having a unidirectional flexibility, comprising a plurality of rigid floats which are swingably connected by hinge means. Planar skirts are connected to the floats so as to define at least one continuous oil fence wall thereby.

Keywords: Pollutant collection; Pollutant, surface barrier

U.S. Cl. X.R. 16-150





3,868,268

# UNDER-WATER SPRAYING

Nicholas Norbert Tusch, London; Robert Ian Watson, Blackburn, and Jack Taylor, Accrington, all of England, assignors to Colebrand Limited, London, England

Division of Ser. No. 174,445, Aug. 24, 1971, Pat. No. 3,788,273. This application Aug. 27, 1973, Ser. No. 391,714  
Int. Cl. B05c 5/02

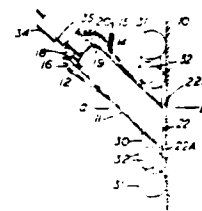
U.S. Cl. 117-104 R

14 Claims

The described invention relates to a method and apparatus for applying paint or the like to a submerged surface and includes the provision of a hollow shield with an elongated opening which shield is purged of water by compressed air the resultant airfilled space being traversed by a sheet-like spray of the paint supplied from atomising means and formed so as to be substantially uninterrupted by the internal wall of the shield. Various systems are described by way of elaboration of the actual margin of the shield to accommodate different surfaces; to provide for maintaining appropriate spacing between the margin of the shield and the surface and for affording mobility of the whole apparatus.

Keywords: Coating; Structure repair

U.S. Cl. X.R. 29-81K; 114-222



3,868,313

# CATHODIC PROTECTION

Philip James Gay, 91 Newland Park, Hull, Yorkshire, England  
Filed Feb. 21, 1973, Ser. No. 334,317

Claims priority, application Great Britain, Feb. 25, 1972, 8771,72

Int. Cl. C23f 13/00

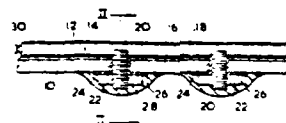
U.S. Cl. 204-196

10 Claims

A cathodic protection system for a metal substrate has an anode which is normally electrically insulated from the substrate but which is disposed very close to the substrate. Cathodic protection only becomes effective when the electrical insulation breaks down and the metal substrate would otherwise be subject to corrosion. The system comprises an electrically insulating coating on the metal substrate and an electrically conducting coating applied over the insulating coating, a D.C. voltage being applied between the metal substrate and the conductive coating. The conductive coating or the insulating coating or both may be paint, the conductive layer being rendered conductive by the incorporation of an electrically conductive material such as elemental carbon.

Keywords: Cathodic protection; Coating; Corrosion prevention

U.S. Cl. X.R. 204-147



3,868,623  
TOWABLE SONAR ARRAY WITH DEPTH  
COMPENSATION

Frank R. Abbott, San Diego, Calif., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

File 1 Aug. 24, 1973, Ser. No. 391,198

Int. Cl. G01V 7/26

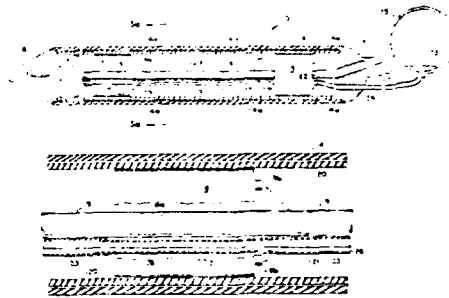
U.S. Cl. 340-7.00

8 Claims

A towed sonar array has a number of transducer elements carried within an elongate, compliant, gas-filled sleeve. A smaller, elongate, resilient tublet extends the length of the compliant sleeve and is filled with mercury to offset the buoyancy of the gas-filled sleeve. As the towed array is lowered deeper and deeper in the water, the compliant sleeve and resilient tublet begin to collapse. At maximum useable depth, the gas is displaced to the interior of the transducer elements and the mercury is squeezed into an externally carried, rigid reservoir. The towed array retains a neutrally buoyant characteristic to avoid the problems associated with excessive turbulence and flow noise, yet is much more sensitive than a fluid filled array.

Keywords: Seismic hydrophone array; Seismic streamer cable; Towed body depth control

U.S. Cl. X.R. 114-235B; 340-8PC



3,868,624  
APPARATUS FOR MAPPING ACOUSTIC FIELDS

Harper John Whitehouse, and Tibor G. Horvath, both of San Diego, Calif., assignors to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Dec. 29, 1972, Ser. No. 319,124

Int. Cl. H04b 13/00

U.S. Cl. 340-8 R

2 Claims

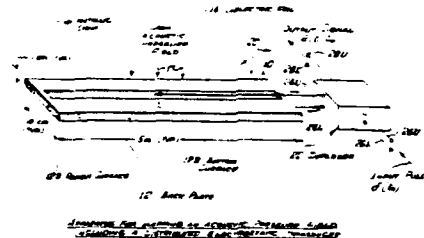
Apparatus useful for mapping fields in the range of infrasonic to ultrasonic, comprising a distributed electrostatic transducer, functioning as a strip transmission line, which includes a flat, substantially rectangular, metal plate, one surface of which is rough, the plate having a length generally in the range of 10 to 100 wavelengths of the frequency at which the mapping is to be done. A rectangular strip of dielectric foil is disposed under tension on the rough surface of the metal plate so that the foil touches only the most protruding parts of the surface. A long, narrow, rectangular, metallic strip is disposed on and attached to the dielectric foil, the strip being exposed to, and therefore defining, an acoustic pressure field.

A duplexer is electrically connected to the metallic strip and to the flat plate, and is connectable to a source of input signals, and has output terminals at which the output signal may be measured. The result being that, when an electromagnetic delta function is applied at the input to the duplexer, electromagnetic waves travel along the strip transmission line, the duplexer having the function of separating the returning signal reaching the output terminals of the duplexer from the outgoing signal which is interrogating the line. The returning signal contains two groups of frequencies: (1) low-frequency

Keywords: Seismic hydrophone

U.S. Cl. X.R. 179-111R; 307-88ET; 310-9.7

components identical to those present in the acoustic pressure field, and (2) high-frequency components containing wave vectors, also present in the acoustic pressure field, the two components being readily separable, and hence the pressure field may be reconstructed.



MARCH 4, 1972

3,868,824

**MODULAR OIL CONTAINMENT BOOM**

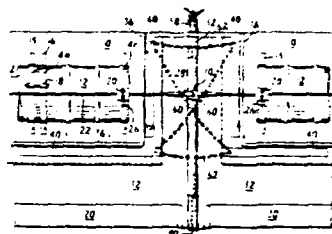
Robert K. Thurman, Carmel, N.Y., assignor to Merritt Division of Murphy Pacific Marine Salvage, New York, N.Y.  
Continuation-in-part of Ser. No. 78,801, Oct. 7, 1970, Pat. No. 3,751,925. This application July 2, 1973, Ser. No. 375,767  
Int. Cl. E02b 15/04

U.S. Cl. 61-1 F

4 Claims

A floating oil containment boom is formed of a multiplicity of boom modules which may easily be connected and disconnected while afloat. The modules include a vertical barrier member, on both sides of which are connected a pair of foam-filled drums. A flexible waterproof panel having a zipper on each end is secured to the barrier member by use of battens fastened to the barrier member over the panel and outside a welt formed on the panel edges where the panel overlaps the barrier member. A piping is formed adjacent and parallel to the zipper on the end of the panel for use in connection with a slotted tube as an auxiliary means for fastening adjacent panel ends together. A set of chains is provided for interconnecting the top and bottom end corners of adjacent barrier members together to prevent excessive vertical and angular displacement between adjacent modules to prevent stressing of the flexible panel by heavy wave action.

Keywords: Pollutant collection; Pollutant, surface barrier



3,869,385

**PROCESS FOR CONTAINING OIL SPILLS**

William L. Stanley, Richmond, and Allen G. Pittman, El Cerrito, both of Calif., assignors to The United States of America as represented by the Secretary of Agriculture, Washington, D.C.

Filed Oct. 18, 1971, Ser. No. 190,320  
Int. Cl. C02b 9/02

U.S. Cl. 210-53

8 Claims

Oil spills on bodies of water are contained by applying a polyisocyanate and a polyamine thereto.

Keywords: Pollutant absorption; Pollutant, surface barrier

U.S. Cl. X.R. 210-54; 210-D16.21

No Figure

3,869,532  
METHOD OF MANUFACTURING FLOATING BOAT  
DOCK MODULES

Clarence Lee Shirrell, Cape Girardeau, Mo., assignor to Rosecon, Inc., Cape Girardeau, Mo.

Filed Jan. 11, 1974, Ser. No. 432,536

Int. Cl. B28b 1/08; B63b 35/00

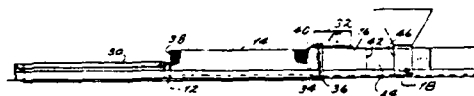
U.S. Cl. 264-71

12 Claims

A cement coated, wire reinforced, styrofoam core floating boat dock module is produced by fastening a plurality of layers of wire mesh about the styrofoam core; placing the core on a pan-shaped container member containing sufficient concrete to form a bottom portion of the module; feeding the core member and container into an alignment portion of a coating apparatus to align the core member with a coating portion of the apparatus; continuing to feed the core member and container into the coating portion of the apparatus where it is coated a portion at a time; continuing to feed the core member and container member through a sizing portion subsequent to the coating portion so that the external dimensions of the module are established; removing the coated module from the sizing portion and applying a sufficient thickness of concrete coating to the end portions of the module so as to completely enclose the core member and wire mesh.

Keywords: Pier, floating; Small-craft pier

U.S. Cl. X.R. 114-.5F; 264-256; 425-126



MARCH 11, 1975

3,869,814  
EXCAVATOR WITH DRAGLINE EQUIPMENT

Alexandr Vladimirovich Rannev, ulitsa Veernaya, 3, korpus 4, kv. 68; Arvid Karlovich Reish, ulitsa Barrikadnaya, 19, kv. 55, both of Moscow; Viktor Alexandrovich Svirsky, ulitsa Shevlyakova, 45, kv. 11, Ljubertsky, Moskovskoi oblasti, and Boris Danilovich Khodykin, ulitsa Saikina, 1/2, kv. 128, Moscow, all of U.S.S.R.

Filed July 10, 1973, Ser. No. 377,915

Claims priority, application U.S.S.R., July 11, 1972, 1803101

Int. Cl. E02t 3/48

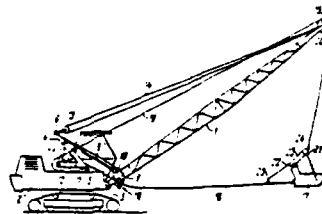
U.S. Cl. 37-116

1 Claim

An excavator with a dragline equipment wherein hydraulic cylinders are pivotally attached to a boom close to its foot pin. A turntable of the excavator wherein a pivotally mounted frame is provided capable of turning in a vertical plane and movably linked with the boom by means of a derricking rope. The hydraulic cylinders piston rods are attached to an upper part of the frame and rope drums serving to operate a bucket being mounted on said frame.

Keywords: Dredge, mechanical

U.S. Cl. X.R. 37-135; 212-35R; 212-59R



3,869,911  
WATER CURRENT OR TIDE DIRECTION-OF-FLOW  
INDICATOR

Howard M. Levy, P.O. Box 1150, Coconut Grove, Miami, Fla.  
33133

Filed Feb. 1, 1974, Ser. No. 438,652  
Int. Cl. G01w 1:00

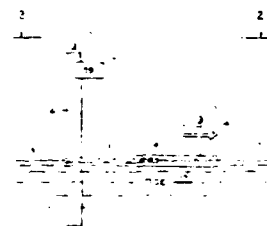
U.S. Cl. 73-170 A

8 Claims

In a preferred embodiment, a metallic coated loop thereby corrosion resistant, rigidly attached to a rigid float structure having an arrow supported thereabove indicating the direction in which the float is being dragged when the loop is looped around a piling in the water, the loop structure being preferably a hollow tube and thereby also buoyant, a major mass of the float being under the water surface to thereby gain the full effect of drag of the current while also thereby deterring any substantial effect of wind on the float and/or arrow, and the arrow preferably being coated with luminous paint and also with a light which may be compared with the light mounted on the beacon piling as a further indicator of the direction in which the current is flowing and is thus dragging the float.

Keywords: Current measurement; Tide measurement

U.S. Cl. X.R. 73-188



3,869,913  
METHOD AND APPARATUS FOR DETERMINING  
SURFACE WIND VELOCITY

Shale J. Niskin, 2941 Lucaya St., Miami, Fla. 33133

Continuation-in-part of Ser. No. 258,543, June 1, 1972,  
abandoned. This application Sept. 17, 1973, Ser. No. 397,822  
Int. Cl. G01p 13:00

U.S. Cl. 73-189

5 Claims

A method and apparatus for determining surface wind velocity in a certain area consisting of dropping two independent markers of different and known fall rates or connected markers of predetermined fall rates simultaneously from a predesignated height above the ground and observing the distance between the two markers at touchdown which distance is known as drift. It has been ascertained by empirical experience and proven by mathematical computation that such wind drift is directly related to wind velocity so that by use of appropriate tables or by visual observation of the amount of drift, the wind velocity is immediately determined.

Keywords: Instrument, airborne; Wind measurement



3.870.003

STORAGE-VESSEL

Olav Mo, Grønsundsløien 94, 1370 Asker, Norway

Filed July 10, 1972, Ser. No. 269,961

Claims priority, application Norway, July 9, 1971, 2632/71; Jan. 17, 1972, 84/72

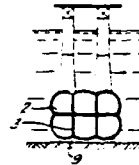
Int. Cl. B63b 35/44

U.S. Cl. 114—5 T

4 Claims

A semi-submersible vessel for loading, storing and transporting liquid has a main hull which lies on the sea bed during loading, unloading and storing of the liquid. This hull is airtight and divided into cargo compartments having outer walls formed as portions of cylindrical shells. A slim superstructure including columns is rigidly connected to and extends upwardly from the main hull and supports a deck structure. The center of gravity of the vessel is always below the center of buoyancy thereof to provide the vessel with a total weight and a weight stability enabling it to rest on the sea bed without anchors, moorings or the like.

Keywords: Offshore platform, fixed; Offshore platform, floating; Offshore storage tank, submerged



3.870.009

PROTECTIVE COVERING APPARATUS FOR A SUBMERGED STRUCTURE

Orval E. Liddell, Avalon, Calif.

Division of Ser. No. 837,259, June 27, 1969, Pat. No.

3,581,305. This application Feb. 16, 1971, Ser. No. 115,831

Int. Cl. B63c 1/00, E03c 3/00

U.S. Cl. 114—222

5 Claims

A protective covering for a submerged structure such as a boat, drydock, barge, float, pier, bulk head, and the like. The covering includes a pliable generally waterproof sheet and attachment means for securing spaced portions of the sheet to the surface of the structure to be protected whereby the sheet will resist deterioration of the structure. A novel method of installing the protective covering utilizing a plurality of buoyancy units is disclosed. The use of such buoyancy units permits the covering to be readily maneuvered underneath a floating structure so that the structure may be easily covered in situ.

Keywords: Corrosion prevention; Fouling prevention

U.S. Cl. X.R. 61-54



3.870.010

MOORING SYSTEM FOR FLOATING STRUCTURES

Everald V. Wright, Pittsburgh, Pa., assignor to Dravo Corporation, Pittsburgh, Pa.

Filed Sept. 4, 1973, Ser. No. 394,200

Int. Cl. B63b 21/00

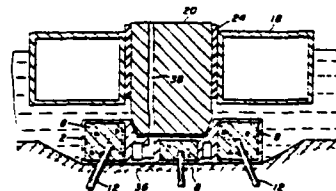
U.S. Cl. 114—230

5 Claims

A mooring system is disclosed for securing floating structures to the bottom of a body of water. A base unit having a tapered recess or protrusion in the top surface is fixed to the bottom. A mooring unit sized and shaped to fit the tapered recess or protrusion in the base unit is movably attached to the floating structure so as to allow relative vertical movement between the mooring unit and the floating structure. The mooring unit is secured to the base unit so that the floating structure is horizontally restrained but can move vertically in response to waves or tidal action.

Keywords: Cofferdam; Offshore mooring structure; Offshore platform anchor

U.S. Cl. X.R. 9-8P; 61-46; 114-.5F



157

3,870,615

# SACRIFICIAL ANODE

Fred V. Wilson, and Henry J. Leblanc, Sr., both of Port Arthur, Tex., assignors to Standard Brass and Manufacturing Company, Port Arthur, Tex.

Continuation of Ser. No. 214,207, Dec. 30, 1971, abandoned.

This application Oct. 1, 1973, Ser. No. 402,360

Int. Cl. C23F 13/00

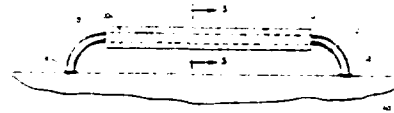
U.S. Cl. 204—197

2 Claims

The opposite ends of the pipe core of a sacrificial anode are bent 90° through an arc having a relatively short radius, of the order of about four times the diameter of the pipe core.

Keywords: Cathodic protection; Corrosion prevention

U.S. Cl. X.R. 204-286; 204-297R



3,870,893

# WAVE OPERATED POWER PLANT

Henry A. Mattera, 736 Fern St., Yeadon, Pa. 19050

Filed Oct. 15, 1973, Ser. No. 406,545

Int. Cl. F03b 13/12

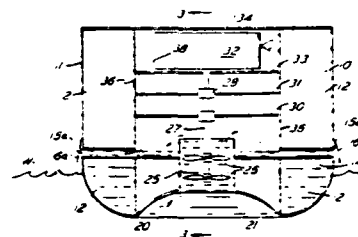
U.S. Cl. 290—53

4 Claims

A wave operated power plant is described wherein a buoyant vessel is anchored on the ocean surface with the wave motion forcing ocean water up through vertical pipes in the hull causing rotation of blades in the pipes thereby through shafts rotating electrical generators and generating electricity, the water exhausted from the tubes being discharged onto a deck above the ends of the pipes and to the ocean.

Keywords: Electrical generator; Power, wave

U.S. Cl. X.R. 290-42



MARCH 18, 1975

3,871,181

# METHOD OF FORMING AN ENCLOSURE IN A BODY OF WATER

Leon B. DeLong, New York, N.Y., assignor to DeLong Corporation, New York, N.Y.

Filed Feb. 15, 1974, Ser. No. 443,156

Int. Cl. E02d 23/08, E02b 1/00, E02d 23/16

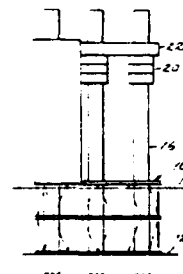
U.S. Cl. 61—34

6 Claims

A method of forming an enclosure in a large body of water for the storage of oil and the like, using a base template seated on the marine floor and extending out of the water. A series of caissons or support posts are positioned within the template and driven into the marine floor to provide support for a top template attachable to the caissons and capable of moving up and down on them. Sheet pile cells are then secured at their upper portions to the top template with their bottom portions resting against the upper portion of the bottom template out of the water, so as to prevent any wave action from interfering with the construction of the enclosure. The enclosure is then lowered into the water; the sheet pile cells are unfastened from the top template and then driven into the marine floor. The top template, bottom template and caissons are then all removed from inside the enclosure.

Keywords: Cofferdam; Offshore construction; Offshore platform, jack up; Offshore storage tank, emergent; Pile, sheet; Pile, steel

U.S. Cl. X.R. 61-46; 61-46.5; 61-50



168

3,871,182  
METHOD OF PROTECTION FOR SLOPES AND CRESTS  
OF RIVERS, CHANNELS, AND THE LIKE

Jose Estruco, Blas Parera 691, Rosario, Argentina  
Filed Nov. 5, 1973, Ser. No. 412,825

Claims priority, application Argentina, Nov. 9, 1972,  
245070

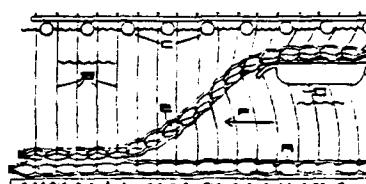
Int. Cl. E02b 3/12

U.S. Cl. 61-38

1 Claim

A method is disclosed for protecting slopes and crests of rivers, channels, and the like by mooring flexible and permeable tubular casings filled with fresh concrete. Those tubular casings may be made of synthetic fibers, burlap, canvas, etc., and are simultaneously filled with fresh concrete while being placed at the foot of surfaces which must be protected. The tubular casing is lowered by gravity to its position by means of a series of ropes tied to the tubular casing at one of their ends with the other end of the ropes being secured to an element placed at the surface of the water. The ropes provide guides for the mooring of other casings similar to the above-mentioned one with the rolls, loops or rings or any other element being used for aligning purposes through which ropes of the first casing may pass so that the following casing necessarily are placed one over the other until the rolls appear at the surface of the water.

Keywords: Concrete form; Fabric mat; Revetment; Seabed material placement; Slope protection



3,871,184  
POSITION AND ANCHORING SYSTEM FOR OFF-SHORE  
DRILLING PLATFORM

Joseph F. Schirtzinger, Pasadena, Calif., assignor to Sea-Log Corporation, Pasadena, Calif.

Filed Apr. 8, 1974, Ser. No. 459,030

Int. Cl. E02b 17/00; E02d 27/04

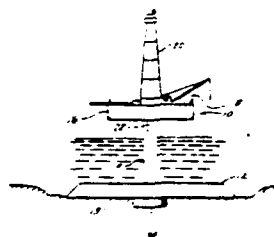
U.S. Cl. 61-46.5

4 Claims

A monopad drilling structure in which the bottom of the structure is a flat surface resting on the ocean floor. A submerged cellar structure is emplaced over the drill site. Cables extend from the deck of the drilling platform through a moon pool extending through the bottom wall of the base. The cables extend radially outwardly from the opening and connect to the emplaced cellar structure. Controlling tension on the cables permits the platform to be moved laterally in relation to the cellar structure to move the moon pool directly over selected drilling locations within the confines of the cellar structure.

Keywords: Offshore platform anchor; Offshore platform, fixed; Offshore platform, floating

U.S. Cl. X.R. 61-82; 166-.5; 175-9





3.871.228

**PERMEABLE MEMBRANE GAS SATUROMETER**

Ray Franklin Weiss, La Jolla, Calif., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed May 14, 1973, Ser. No. 360,249

Int. Cl. G01n 7/10

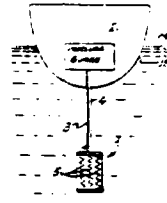
U.S. Cl. 73-19

6 Claims

The satumeter measures the total dissolved gas pressure present in solutions such as in rivers, lakes, and other water bodies. A di-methyl silicone rubber tubing, permeable to gases and water vapor, is immersed in the water and a precision pressure gauge coupled to the tubing measures the internal pressures produced by gas components diffusing into the bore through the membrane wall.

**Keywords:** Pollutant measurement

U.S. Cl. X.R. 55-158



MARCH 25, 1975

3.872.679

**APPARATUS AND METHOD FOR REDUCING THE FORCES ON EXTENDIBLE LEGS OF A FLOATING VESSEL**

William Fischer, Fullerton, Calif., assignor to Chevron Research Company, San Francisco, Calif.

Filed Dec. 21, 1973, Ser. No. 427,175

Int. Cl. E02b 17/00; B63b 35/00

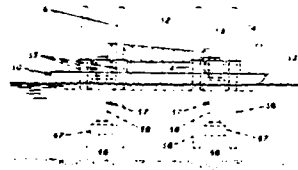
U.S. Cl. 61-46.5

12 Claims

Semi-submersible legs are embodied as close-ended cylinders or other similar shapes or combination of shapes having the capability to be ballasted or made buoyant. The semi-submersible legs are connected to a jack-up drilling vessel so that they slide vertically through the vessel deck into the underlying body of water and are lockable at any position along their vertical path. The method of their use requires lowering the extendible main supporting legs of a jack-up drilling vessel above the ocean floor, lowering the semi-submersible legs into the water, making them buoyant so as to cause the vessel to raise out of the water to a distance above probable wave action at which time the extendible main support legs are lowered to a supporting position onto or into the ocean floor. With the extendible supporting legs in a supporting position, the semi-submersible legs are retracted; if the extendible legs penetrate a soft bottom, the semi-submersible legs are first ballasted to serve as an additional jacking down source for the supporting legs and then retracted and deballasted. The foregoing steps are reversed when the drilling vessel is to be relocated with or without the supplemental steps of making the semi-submersible legs additionally buoyant and or lowering the vessel hull to the water surface thus providing an extra lift force on the support legs. The vessel hull is jacked up on the buoyant support of the semi-submersible legs prior to completely removing the extendible main legs from the ocean floor penetration or surface contact.

**Keywords:** Offshore construction; Offshore platform, jack up; Offshore platform, leg

U.S. Cl. X.R. 114-.5D



3,872,819

**WAVE-ACTUATED HORIZONTAL ARRAY STRETCHER**  
George O. Pickens, San Diego, Calif., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Feb. 19, 1974, Ser. No. 443,646

Int. Cl. B63h 19/02

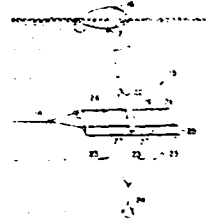
U.S. Cl. 115-4

12 Claims

A wave-actuated propulsion motor includes a surface float having a support depending therefrom carrying a plurality of freely pivotable fins. A weight suspended from the underside of said support stabilizes the support in a horizontal plane and provides a downward force counter to the buoyant force provided by the surface float. Pivotal or flexible fins are moved between two limit positions or flexed by water displaced by vertical movements of the support in following wave-induced motions of the surface float. A towing connection is made to the framework to transmit horizontal forces caused by deflection of the fin-controlled water movements in a horizontal plane.

Keywords: Instrument deployment; Power, wave

U.S. Cl. X.R. 114-230



APRIL 1, 1975

3,874,101

**DREDGER WITH ADJUSTABLE ENDLESS DIGGER AND ROTARY MUD SLINGER**

Oliver Frank Cummins, 1208 Kiplino Ave., Islington, Ontario, Canada

Filed Jan. 31, 1974, Ser. No. 438,367

Int. Cl. E02f 3/14, 9/04

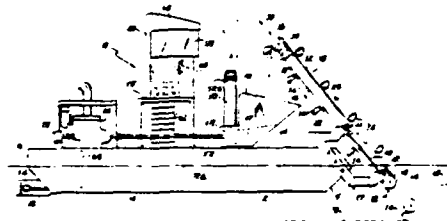
U.S. Cl. 37-69

6 Claims

A self-contained mud excavating apparatus comprising a floatable hull having an endless scoop type dredging conveyor adjustably mounted upon its bow. A hopper is mounted on the deck of the hull for receiving the dredged material. A mud slinger is located in the hopper and picks up the dredged material and throws it sideways away from the hull. Rails mounted on the sides of the hull carry roller-mounted frames equipped with spuds for use in anchoring and maneuvering the hull.

Keywords: Dredge ladder control; Dredge, mechanical; Dredge propulsion; Dredge-spoil transport

U.S. Cl. X.R. 37-73; 198-44; 198-64; 198-128



3,874,177  
POCKET MAT

Jan Gerrit De Winter, Enschede, Netherlands, assignor to  
Nicolon B.V., Richtersweg, Enschede, Netherlands  
Filed June 11, 1973, Ser. No. 369,063  
Int. Cl. E02b 3/12

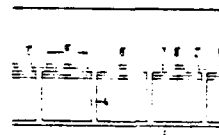
U.S. Cl. 61-38

5 Claims

A mat for use in covering a slope or bank of a waterway, and comprising a web of synthetic yarn, said fabric being permeable to water, but impermeable to sand and earth, and a plurality of pockets succeeding one another in the longitudinal direction of the web and each extending over a transverse portion of said web, said pockets having rear walls constituted by said web of fabric, and in use being in contact with the ground, and said pockets being further constituted by a second web of fabric, which is interwoven with the web first-mentioned to form a double cloth, both in transverse narrow strips extending between each adjacent pair of pockets substantially throughout said transverse portion, and in a continuous longitudinal narrow strip interconnecting a marginal portion of said second web with the web first-mentioned.

Keywords: Fabric mat; Slope protection

U.S. Cl. X.R. 161-70; 161-79; 161-145



3,874,179

SUBMARINE OIL STORAGE TANK SYSTEM

Nobuo Higashihara, Tokyo, Japan, assignor to Sumitomo Shipbuilding & Machinery Co., Ltd., Tokyo, Japan  
Filed Mar. 6, 1973, Ser. No. 338,478

Claims priority, application Japan, Mar. 6, 1972, 47-22338;  
Mar. 6, 1972, 47-22339; Apr. 4, 1972, 47-41281

Int. Cl. E02b 17/00; B65d 25/24

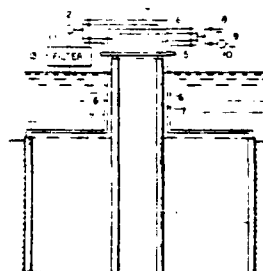
U.S. Cl. 61-46

3 Claims

An undersea oil storage tank system and method of constructing same, which has a plurality of steel tubes driven into the ocean bottom adjacent one another. A jet lifter pipe is placed in the upper open end of the pipe to evacuate the soil or mud from the interior of the pipe. After the pipe interior has been evacuated, the bottom thereof is closed with concrete and a metal cover is welded onto the upper end of pipe. Suitable water evacuation and oil supply conduits are connected to the pipe with a control station for selectively removing the sea water from the pipes and supplying oil for storage in the undersea storage tanks.

Keywords: Offshore storage tank, submerged;  
Pipe, steel

U.S. Cl. X.R. 61-5; 220-18



3,874,180

**MODULAR OFFSHORE STRUCTURE SYSTEM**

Maurice N. Sumner, 1718 Lubbock St., Houston, Tex. 77007  
Division of Ser. No. 107,288, Jan. 18, 1971, Pat. No.  
3,716,993, which is a continuation-in-part of Ser. No. 649,889,  
June 29, 1967, Pat. No. 3,575,005. This application Apr. 13,  
1972, Ser. No. 243,790

Int. Cl. E02b 17/04, E02c 5/00

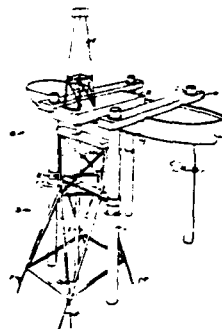
U.S. Cl. 61-46.5

20 Claims

A modular-like system of offshore structures for imparting flexibility to the offshore exploration and production and transportation industries so that exploration, production and development work can take place over a large range of marine depths and operational circumstances with one or more marine vessels.

**Keywords:** Offshore platform, fixed; Offshore platform, jack up; Pile placement; Seabed foundation

U.S. Cl. X.R. 61-50; 114-.50; 114-43.5



3,874,181

**HIGH LOAD CARRYING CAPACITY, FREEZE AND CRACK-PROOF CONCRETE METAL PILE**

Ivo C. Pogonowski, Houston, Tex., assignor to Texaco Inc., New York, N.Y.

Division of Ser. No. 247,584, April 26, 1972, Pat. No.  
3,795,035. This application Sept. 28, 1973, Ser. No. 401,778  
Int. Cl. E02d 5/48, 31/12

U.S. Cl. 61-53

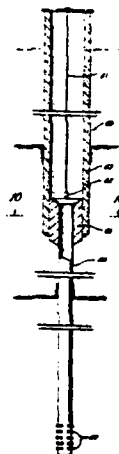
6 Claims

At least two methods for swaging one vertical smaller tubular member internally of a larger tubular member are disclosed. One device for practicing the method comprises a cylindrical swage block for loosely fitting in the large tubular member and resting on the upper edge of the inner smaller tubular member. A plurality (preferably six) pistons and cylinders are suspended from the swage block a precise distance below the upper edge and actuatable radially from the longitudinal axis of the smaller tubular member for deforming the upper edge portion thereof against the larger tubular member for providing more working space internally of the tubular members. A modification comprises a plurality as seven axially spaced apart, parallel layers of swaging pistons and cylinders suspended from the swage block.

Other new devices utilizing the multiple piston and cylinder swage are a mechanisms for cold-work connecting two telescopic pipe ends together, and a mechanism for making a new pile with anchor knobs for increased load carrying capacity and pull-out resistance.

**Keywords:** Embedment anchor; Ice protection; Pile, concrete; Pile, steel

U.S. Cl. X.R. 61-1; 61-53.6; 61-53.68; 138-28



3,874,237

LIQUID LEVEL HEIGHT MEASURING APPARATUS

Cornelis M. G. Zwarts, Pointe Gatineau, Quebec, Canada,  
assignor to Canadian Patents and Development Limited,  
Ottawa, Canada

Filed Feb. 15, 1973, Ser. No. 332,544

Int. Cl. G01F 23/28

U.S. Cl. 73-290 R

5 Claims

A liquid level height measuring device that is a transmission line oscillator comprising a parallel conductor transmission line positionable in the liquid whose height is to be measured and a sensor in the form of a switching device whose switching frequency is dependent only on transmission line length and thus on liquid level. The transmission line preferably includes a length of flexible coaxial cable connected in series to a rigid coaxial conductor structure with the center conductor positioned in relation to and electrically insulated from the outer conductor which has perforations over its working length for ready entry of the liquid into the space between conductors. The sensor is a two terminal bistable switching device, preferably a tunnel diode, connected to the transmission line such that a switching signal is generated whose frequency is dependent only on the transmission length.

Keywords: Wave measurement



3,874,462

DEVICE FOR TAKING CORE SAMPLES FROM OCEAN  
AND OTHER SUBMARINE FLOORS

Horst Harms, Bremerhaven, and Wilhelm Lucht, Nordenham,  
both of Germany, assignors to Aktiengesellschaft "Weser",  
Bremen, Germany

Filed Jan. 18, 1974, Ser. No. 434,576

Claims priority, application Germany, Apr. 27, 1973,  
2321291

Int. Cl. E21b 7/12, 25/00

U.S. Cl. 175-5

3 Claims

A core barrel for taking a sample core from a submarine floor is provided, and a guide tube for deploying and recovering the core barrel has a center passage through which the core barrel can move. The guide tube has an open end for entry and exit of the core barrel and its passage diverges conically in the direction towards this open end. Barrel-guiding elements are located within the passage for guiding the barrel.

Keywords: Instrument deployment; Instrument retrieval; Sampler, seabed-driven core

U.S. Cl. X.R. 175-220



3,874,465

CORING APPARATUS

John Wallace Young; Robert Charles Firkins, both of Flatonia; Gregg Ring, and John A. Tatum, Jr., both of Houston, all of Tex., assignors to The Randolph Company, Houston, Tex.  
Filed Oct. 2, 1973, Ser. No. 402,920  
Int. Cl. E21b 25/00

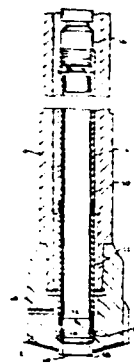
U.S. Cl. 175-236

15 Claims

A formation coring apparatus suitable for coring relatively soft formations which apparatus includes a core barrel with an interior surface having properties similar to synthetic rubber and two semitubular rigid portions joined along at least one of the adjacent edges by a flexible material, a core catcher having a plurality of flexible segments adapted to open while the core is being drilled and to close with the segments supporting the core thereabove to recover the core, a coring bit and a wire line tool adapted to carry the core barrel and the core catcher into position within the coring bit and having a fishing neck to be engaged by a wire line device for recovery, a latch for retaining the tool in position within the coring bit, a swivel allowing the core barrel and catcher to remain stationary while the coring bit is rotated and a check valve allowing fluid flow from the top of the core barrel because of the entry of the core therein to flow out the tool while preventing inflow of fluids into the top of the tool.

Keywords: Sampler, seabed-drilled core

U.S. Cl. X.R. 175-239; 175-243; 175-251



3,875,062

DEVICE FOR CLEANING WATER POLLUTED BY OIL

Johann Rafael, Maxstrasse 36, Salzburg, Austria  
Filed Sept. 25, 1973, Ser. No. 400,633  
Claims priority, application Germany, Sept. 25, 1972, 2246958

Int. Cl. E02b 15/04

U.S. Cl. 210-242

6 Claims

A buoyant cleaning device for water polluted by oil, comprising a collecting chamber for the polluted water, the collecting chamber having a cover which is so arched that the oil accumulates preferably in the range of the highest point of the arch and an oil-removal feature is provided at said highest point of the arched cover.

Keywords: Pollutant collection; Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.21



3,875,549  
**TRANSMITTER TRIGGER CIRCUIT FOR  
 ECHO-SOUNDERS OR SIMILAR DEVICES**  
 Erik Stenersen, and Sverre Johannessen, both of Horten, Nor-  
 way, assignors to Simrad A.S., Horten, Norway  
 Filed June 27, 1973, Ser. No. 374,103  
 Claims priority, application Norway, June 27, 1972,  
 2294/72

Int. Cl. G01s 9/68

U.S. Cl. 340—3 E

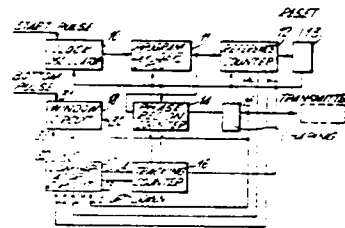
2 Claims

The invention relates to a device for adjusting the trigger timing of distance measuring equipment based on measuring the delay time for reflection of transmitted pulses of energy, e.g. echo-sounding equipment. The device comprises a detector designed to indicate whether an echo of prescribed characteristics is received within a prescribed period of time, or whether the echo fails to arrive. A phase comparator determines whether an echo of prescribed characteristics is received before or after the prescribed period of time. A variable-delay circuit is controlled by the detector and the phase comparator in order to delay the triggering of the transmitter of energy pulses, in such a way that echoes of prescribed characteristics will be received within the prescribed region of time, by maintaining the delay constant when the detector indicates echoes within the prescribed period of time, and by increasing or reducing the delay according to command from the phase comparator when the echo is received before or after the prescribed period of time, respectively.

Applied to echo sounding apparatus the echo signal of the prescribed characteristic is usually constituted by the bottom echo signal, and in this case the present timing device will carry out an automatic recorder phasing to always secure a recording of the bottom contour within the automatically set recorder range, irrespectively of changing ocean depth.

Keywords: Sonar, depth sounder

U.S. Cl. X.R. 343-7.5



APRIL 8, 1975

3,875,750  
**MODULAR EROSION CONTROL DEVICE**  
 Herbert Campbell, 10281 Rt. 306, Kirtland, Ohio 44094  
 Filed Jan. 4, 1974, Ser. No. 430,783  
 Int. Cl. E02b 3/06

U.S. Cl. 61—4

11 Claims

A modular unit for marine use in preventing and reversing erosion of waterfront land due to wave action is described. The device is an elongated block which in cross-section has a topmost peak and at least one additional lower peak located forwardly (toward the water) of the topmost peak. The peaks are separated by depressions, and each of them is defined at least in part by a rearwardly sloping surface.

Keywords: Breakwater, concrete



3,875,796

**APPARATUS FOR CONTINUOUSLY RECORDING  
SEA-FLOOR SEDIMENT CORER OPERATIONS**

Thomas C. Gilliard, Kailua, Hawaii, assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed June 13, 1974, Ser. No. 479,066

Int. Cl. G01n 1/00, G01v 9/00

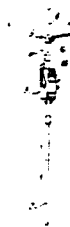
U.S. Cl. 73-170 A

6 Claims

Keywords: Instrument, seabed in situ;  
Sampler, seabed-driven core; Seabed  
property measurement

U.S. Cl. X.R. 73-153

The apparatus provides a continuous, timed record of corer orientation data including corer declination, inclination, vertical acceleration. A compass, bubble levels, an accelerometer and a clock continuously provide the data. Indicators for these mechanisms are disposed in the focal plane of a battery-driven motion picture camera coupled into a switching circuit which also includes camera lights. A switching mechanism using a magnetic reed switch energizes the camera, lights etcetera at the moment the corer is released to begin its free-fall into sediment penetration.



APRIL 15, 1975

3,877,159

**ROTARY DISK CUTTER FOR A CUTTER DREDGE**

Gijsbertus Jan Willem Boomstra, 12 Mijndelweg, Wassenaar, Netherlands

Filed June 20, 1973, Ser. No. 371,926

Claims priority, application Netherlands, June 30, 1972, 7209255

Int. Cl. E02f 3/92

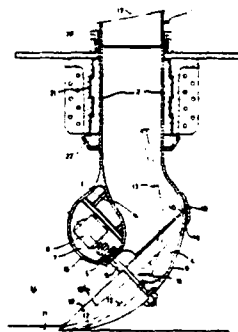
U.S. Cl. 37-64

5 Claims

Keywords: Dredge, cutterhead; Dredge intake

U.S. Cl. X.R. 37-189; 172-604

A disk cutter to be mounted for rotation on a closely adjoining pivotal suction tube end for use in a cutter dredge for a more efficient suction from the disk surface with a relatively small quantity of water.



177



3,877,233

**FLOATING BREAKWATER SYSTEM**

John O. Olsen, Lynnwood, Wash., assignor to Reid, Middleton & Associates, Inc., Edmonds, Wash.

Filed Aug. 28, 1972, Ser. No. 284,453

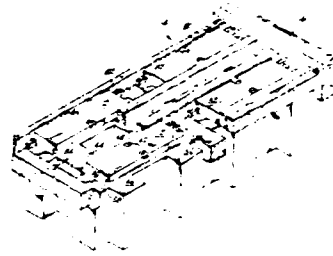
Int. Cl. E02b 3/06

U.S. Cl. 61-5

13 Claims

A low cost floating breakwater system involving a large number of individual pontoon modules secured in an array by a network of structural members. The modules are shaped such that when nested together in the breakwater array they will provide a grid pattern having a plurality of regularly spaced openings in mutually transverse first and second directions, e.g., in both the lateral and longitudinal directions of the array; and a corresponding grid pattern of vertical walls extending into the upper portion of the wave to dissipate wave action by interference with the movement of fluid in the orbital flow under the wave crest.

Keywords: Breakwater, floating; Low-cost shore protection



3,877,237

**UNDERWATER TRENCHING APPARATUS GUIDANCE SYSTEM**

Robert M. Norman, Lafayette, La., assignor to Norman Offshore Services, Inc., New Orleans, La.

Division of Ser. No. 175,448, Aug. 27, 1971, abandoned. This application Aug. 1, 1973, Ser. No. 384,886

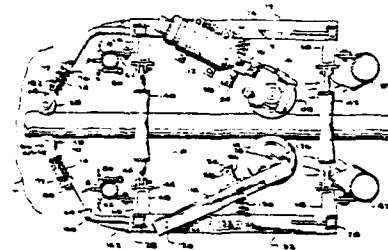
Int. Cl. E02f 5/02, 5/14, F16l 1/00

U.S. Cl. 61-72.4

18 Claims

An underwater self-propelled buoyant trenching apparatus for burying a pipeline or cable on the bottom of a body of water. Water jets on a frame cut the trench. The apparatus is motivated by a drive roller that is resiliently urged against the pipeline. Forward guide rollers positioned ahead of the water jets sense the pipeline direction and act to torque the apparatus onto the centerline of the pipeline.

Keywords: Seabed pipeline placement; Seabed trencher



3,377,238

SEA SLED FOR ENTRENCHING AND PIPE BURYING  
OPERATIONS

Nuke Ming Chang, and Elmer R. Remkes, both of Orange,  
Calif., assignors to Santa Fe International Corporation,  
Orange, Calif.

Filed Nov. 6, 1973, Ser. No. 413,378

Int. Cl. E02f 5/02, 3/88, F04f 5/00

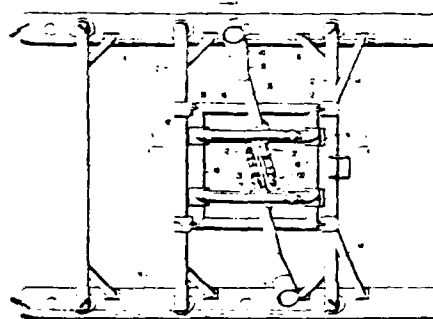
U.S. Cl. 61-72.4

14 Claims

Keywords: Seabed pipeline placement; Seabed  
trencher

U.S. Cl. X.R. 37-61; 37-62; 417-153; 418-183

The sea sled includes a pair of pontoons mounting depending rollers for straddling a pipeline disposed on the sea bottom. Water jets fluidize the sea bottom to form a trench in which the pipeline settles. The slurry formed by the water jets is removed from the trench by the eductor system which includes a pair of conduits each having a suction inlet at its lower end for location within the trench, a discharge at its upper end, a pair of pump nozzles each having an inlet external to the associated conduit and an outlet within the conduit directed toward the corresponding discharge, and a pair of primary nozzles respectively spaced from the inlet ends of the pump nozzles. A high pressure, low volume, fluid is pumped from the surface through the jet nozzles. The fluid emanating from the jet nozzles entrains ambient fluid and delivers low pressure, high volume, fluid through the respective pump nozzles to their corresponding discharges. The action of the pump nozzles in the conduits creates a suction whereby the slurry from the trench is pumped from the trench through the conduits and discharged to opposite sides of the trench.



3,877,520

SUBSEA COMPLETION AND REWORK SYSTEM FOR  
DEEP WATER OIL WELLS

Paul S. Putnam, 8931 La Entrada Ave., Apt. A, Whittier,  
Calif. 90605

Filed Aug. 17, 1973, Ser. No. 389,248  
Int. Cl. E21b 33/035

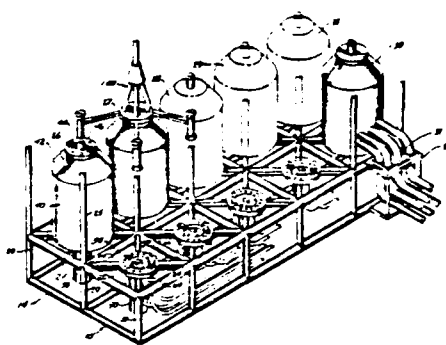
U.S. Cl. 166—6

26 Claims

A subsea completion system for a plurality of wells drilled from a single template, the template being divided into a plurality of wellhead sections and a plurality of equipment sections. Each wellhead section of the template has a concentric stab ring around the wellhead with the production and service tubing extending from the stab rings of the respective wellhead sections to similar stab rings in the equipment sections of the template. Well completion modules, header modules, separator modules, and power equipment modules are individually connected by means of a mating stab ring at the bottom of the modules to the respective stab rings in the template sections after the template is placed on the sea floor and the wells are drilled. Each well completion module includes the production tree, tubing, hydraulic controls, and equipment necessary to operate the well, the tubing and hydraulic lines terminating in the bottom stab ring for connection to the template. An upper stab ring is provided at the top of each module with tubing extending directly to the tubing connections in the lower stab ring through diverters. A multiposition diverter unit is attachable from the surface to the upper stab ring and can be operated to connect a riser to any one of the tubing connections in the stab ring, providing a direct tubing path between the riser and any one of the tubing connections in the corresponding section of the template. The direct tubing connection provides access for the setting or removal of plugs in the tubing in each template section from the surface through the associated module. This permits the tubing in the template to be shut off, permitting removal of any of the modules from the surface.

Keywords: Seabed foundation; Seabed oil,  
process structure

U.S. Cl. X.R. 166-75



3,878,456

STANDARD CONDUCTIVITY CELL FOR  
MEASUREMENT OF SEA WATER SALINITY AND  
TEMPERATURE

Frank H. Stephan, Columbia, and Robert A. Elmiger, Pasadena, both of Calif., assignors to Westinghouse Electric Corporation, Pittsburgh, Pa.

Filed Oct. 9, 1973, Ser. No. 404,576  
Int. Cl. G01n 27/42

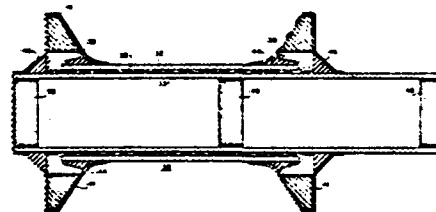
U.S. Cl. 324—30 B

7 Claims

A standard conductivity cell having concentric thin-walled alumina cylinders of different lengths for ease of manufacture, with a thin film or layer of standard seawater contained between them. Electrical contact is made to the standard seawater by end electrodes and a pressure compensation arrangement allows for the cell's use at great depths in the water. With a known relationship between conductivity and temperature, the cell also operates as a very rapid temperature sensor.

Keywords: Bathythermograph; Salinity  
measurement

U.S. Cl. X.R. 73-362AR; 204-195F



APRIL 22, 1975

3,878,662

**METHOD OF CONSTRUCTING A REMOTELY LOCATED  
DRILLING STRUCTURE**

Louis C. Cernosek, 214 Winkler Dr., Houston, Tex. 77017

Filed July 9, 1973, Ser. No. 377,242

Int. Cl. E04g 21/00

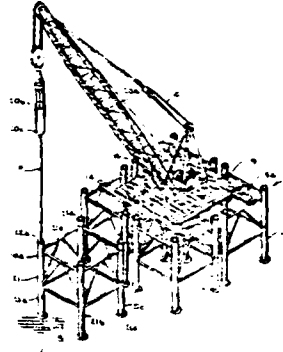
U.S. Cl. 52-745

8 Claims

A drilling structure and method of constructing same which can be located in remote areas including a foundation composed of permanent foundation units, a substructure mounted on the foundation and a derrick mounted on the substructure for drilling for oil or the like in such remote areas. The permanent foundation units, the substructure and the derrick are all comprised of members that can be transported to the remote area by means of a helicopter or the like.

**Keywords:** Offshore construction; Offshore platform, fixed; Pile placement; Seabed foundation

U.S. Cl. X.R. 52-169



3,878,684

**DEVICES FOR PROTECTING THE BASES OF  
STRUCTURES IMMERSED IN A VOLUME OF WATER,  
AGAINST UNDERMINING**

Jacques Edouard Lamy, Fontenay-aux-Roses, France, assignor to C. G. Doris Compagnie Generale pour les Developpements Operationnels des Richesses Sous-Marines, Paris, France  
Continuation-in-part of Ser. No. 358,500, May 9, 1973, Pat. No. 3,846,988. This application Aug. 24, 1973, Ser. No. 391,465

Claims priority, application France, Sept. 15, 1972, 72.32847

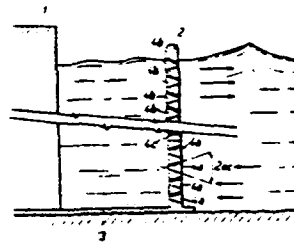
Int. Cl. E02b 3/06

U.S. Cl. 61-3

13 Claims

A device for protecting the bases of structures immersed in a volume of water, against undermining, by means of a wall or curtain constructed in proximity of the said structure and comprising distributed holes for water transfer purposes, the disposition of the perforated wall and of its holes being such that in a water trajectory directed towards the structure, in the zone of the base thereof, and returning towards the open water at a higher level, the pressure drop experienced by the water is smaller than would be the case for a trajectory in the opposite direction.

**Keywords:** Breakwater, concrete; Seabed scour protection; Seawall



3,878,687

**GROUTING OF OFFSHORE STRUCTURES**

Arthur Frank Tragesser, Jr., Houston, Tex., assignor to The Western Company of North America, Houston, Tex.

Filed July 19, 1973, Ser. No. 380,730

Int. Cl. E02b 17/00, E02d 5/64

U.S. Cl. 61-46

2 Claims

A method for grouting the annulus between the jacket and piling in the legs of an offshore structure in which air is introduced to expel water from the lower end of the annulus, and grouting material is pumped into the annulus at the bottom, displacing air upwardly. When sufficient grouting material is introduced to balance the hydrostatic head of the sea water, the grouting is allowed to set up. Additional grouting material may then be introduced from the top.

**Keywords:** Grouting; Offshore platform, leg; Pile, structure connection

U.S. Cl. X.R. 61-53.52; 61-53.6



3,878,946

**APPARATUS FOR LOADING A HOPPER OF A SUCTION DREDGER WITH SAND**

Jan De Koning, Amsterdam, Netherlands, assignor to N.V. Ingenieursbureau voor Systemen en Octrooien "Spanstaal", Rotterdam, Netherlands

Division of Ser. No. 874,212; Nov. 5, 1969, Pat. No. 3,630,400.

This application June 15, 1971, Ser. No. 153,226

Claims priority, application Netherlands, Nov. 8, 1968, 6815921

Int. Cl. B63b 35/30

U.S. Cl. 214-15 B

13 Claims

In loading a hopper of a floating suction dredger with sand a suspension of sand and water is pumped into the hopper. After the hopper is filled up to its maximum permissible carrying capacity in a first loading step additional suspension is pumped into the hopper in a second loading step during simultaneously draining off by lowering drain means in dependence on the weight of the load of the hopper for maintaining the suction dredger substantially loaded at its maximum permissible carrying capacity.

**Keywords:** Dredge, suction; Dredge-spoil transport; Hopper barge

U.S. Cl. X.R. 37-59; 114-26; 137-403



APRIL 29, 1975

3,879,950

**SPECIAL POWER GENERATING UNIT USING  
COMPRESSED AIR PRODUCED BY OCEAN WAVE  
TOGETHER WITH SUPER-HEATED STEAM**

Kiichi Yamada, No. 15-12, 1-Chome Jingumae, Tokyo, Japan  
Continuation-in-part of Ser. No. 148,830, June 1, 1971,  
abandoned. This application Aug. 13, 1973, Ser. No. 387,715  
Int. Cl. F01k 21/04, F03g 7/00

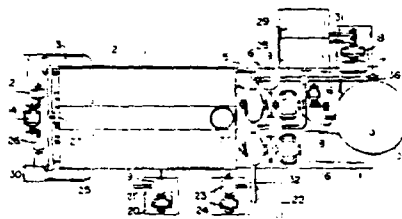
U.S. Cl. 60-698

3 Claims

A special seashore or offshore electric power generating unit using compressed air together with superheated steam, which stores mechanical energy in the form of compressed air during off-peak load periods by using superfluous output of the power plant and ocean wave energy. The plant uses the compressed air thus stored for producing electric power during peak-load periods. The compressed air is heated to the temperature of the superheated steam to be mixed therewith, prior to delivery to a turbine for driving an electric generator.

**Keywords:** Electrical generator; Offshore platform, fixed; Power, wave; Pump

U.S. Cl. X.R. 60-674; 60-500; 417-333



3,879,951

**UNDERWATER DRILLING POLLUTION CONTROL  
CURTAIN**

Charley Mack Mason, Denton, Tex., assignor to Sun Oil Company, Dallas, Tex.

Filed June 25, 1973, Ser. No. 373,580

Int. Cl. E02b 17/00, 15/04

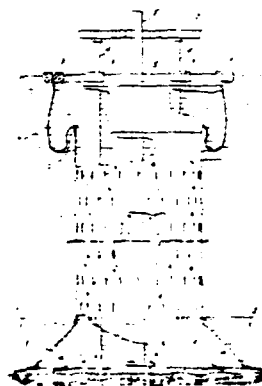
U.S. Cl. 61-1 R

4 Claims

A pollution control curtain attached to the sea floor on one end and to a collar floating on the surface of the sea on the other end for positioning around a drilling platform to entrap the petroleum fluids seeping from the well head or sea floor being serviced by said platform and to convey said fluids to the surface within a predefined area from which they can be collected.

**Keywords:** Pollutant, submerged barrier

U.S. Cl. X.R. 61-1F; 61-46



3,879,952

# PRESSURE RESISTANT CAISSON

Olav Mo, Groensundveien 94, 1360-Nesbru, Norway

Filed Apr. 23, 1973, Ser. No. 353,538

Claims priority, application Norway, May 2, 1972, 1-41/72;  
Dec. 5, 1972, 4471/72

Int. Cl. E02d 27/38; B65g 5/00

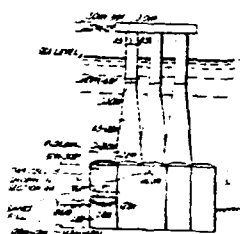
U.S. Cl. 61-46.5

8 Claims

A monolithic offshore platform includes a number of vertical, cylindrical cells which are monolithically attached to each other at the contact points. The cells will therefore circumferentially be subjected to pure compressive forces. In one embodiment, all the cells have the same outer diameter. There is one central cell and around this there are first six cells with the centers on a circle concentric with the central cell, thereafter 12 cells are placed outside. If desired, new rows of cells can be added on the outside. The structure can also be constructed without the central cell. The cells can be closed with a spherical shell in each end.

Keywords: Offshore caisson; Offshore platform, fixed; Offshore platform, leg; Seabed foundation

U.S. Cl. X.R. 61-50



3,880,758

# OIL COLLECTION DEVICE

Frank Galicia, 5043 Catherine St., Philadelphia, Pa. 19143

Filed Apr. 18, 1973, Ser. No. 352,210

Int. Cl. B01d 23/20; E02b 15/04

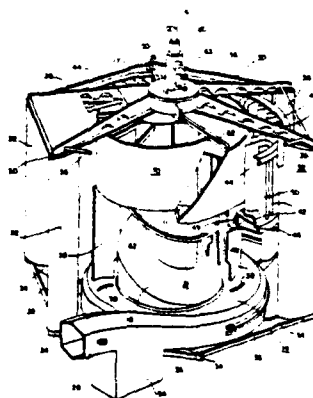
U.S. Cl. 210-187

7 Claims

A floatable collection device where contaminated liquid such as water polluted by oil is collected into a central drum by means of an elongated spiralled inverted V-shaped trough which is circumferentially mounted on the drum. The device includes expulsion means by which the contaminated liquid is expelled from the drum to separation apparatus located elsewhere for separation of the oil from the water.

Keywords: Pollutant, suction removal; Pump

U.S. Cl. X.R. 210-DIG.21; 210-83; 210-242; 210-304; 210-512



3,881,165  
CABLE MOUNTED MAGNETOSTRICTIVE LINE  
HYDROPHONE

David E. Parker, Pawcatuck, Conn., and Henry G. Smith, Jr.,  
Charleston, S.C., assignors to The United States of America  
as represented by the Secretary of the Navy, Washington,  
D.C.

Filed May 6, 1970, Ser. No. 34,929  
Int. Cl. G01v 1/38

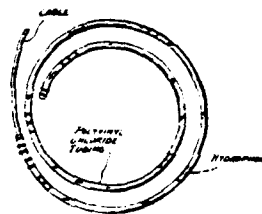
U.S. Cl. 340-3 T

5 Claims

Keywords: Seismic hydrophone

U.S. Cl. X.R. 29-594; 156-51; 340-3B; 340-11

A flexible magnetostrictive hydrophone assembly carried by a multiconductor cable and including at least one sleeve-like flexible hydrophone unit secured in place along the cable. The sleeve-like hydrophone unit has a flexible tubular support core dimensioned for a sliding fit on the cable. The tubular core is a sandwich constructed for pressure release. The core carries a helically coiled magnetostrictive flexible ribbon and a continuous length flexible conductor arranged toroidally around the ribbon helix. The ends of the toroidal conductor are connected to two conductors of the cable and the combination is hermetically sealed.



MAY 6, 1975

3,881,318  
ARCTIC BARRIER FORMATION

David E. Galloway, Simonton, Tex., assignor to Exxon Production Research Company, Houston, Tex.

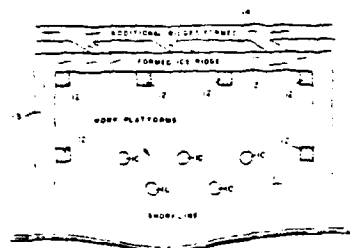
Filed Aug. 27, 1973, Ser. No. 392,146  
Int. Cl. E02b 3/00

U.S. Cl. 61-1 R

3 Claims

Keywords: Ice protection; Offshore construction;  
Offshore island; Offshore structure  
fender; Ice structure

A method and apparatus for the construction of multiple artificial islands (barriers) used to prevent the encroachment of pressure ridges, ice islands and sea ice upon offshore structures, marine pipelines or other marine facilities, in regions, such as arctic regions, where bodies of water are subject to freezing. Each island structure is anchored to the sea floor by piles and/or the gravity of the structure and spaced from another island a predetermined distance ranging along the seaward side of the facilities to be protected. The predetermined distance between the individual island structures depends upon the design of the facilities that are to be protected and a risk evaluation. The shorter the spacing between individual island structures the sooner the effects of grounding will occur for ice formations that move into the region in the colder seasons.





3,881,320  
PILE INSTALLATION IN SUBMERGED BEARING  
STRATA

George J. Gendron, Houston, Tex., assignor to Raymond International Inc., Houston, Tex.

Filed June 27, 1973, Ser. No. 373,977

Int. Cl. E02d 5/34, 5/72

U.S. Cl. 61-53.64

17 Claims

Piles are installed in locations wherein a bearing stratum is submerged beneath a soft nonsupporting stratum. A tubular displacement element is driven down into the bearing stratum by means of a driving member capable of transmitting dynamic driving forces and load resistance effects from one end to the other. The driving member is then removed and a static load carrying column is installed on the displacement element.

Keywords: Pile, concrete; Pile footing; Pile-driving shoe; Pile placement

U.S. Cl. X.R. 61-53.7



3,881,530  
PLANT FOR EVACUATING DREDGED MATERIAL  
Giovanni Faldi, via Forese Donati 27, Florence, Italy

Filed Apr. 3, 1973, Ser. No. 347,373

Claims priority, application Italy, May 17, 1972, 24498/72

Int. Cl. B63b 35/30

U.S. Cl. 141-284

4 Claims

A plant for evacuating dredged material is disclosed, according to which the dredged material, in form of aqueous suspension of high solid content, is loaded into transporting lighters, of the type comprising a closed loading cavity, having an upper loading inlet and a lower discharge connection, and the lighters shuttle between the dredging apparatus and a flow floating station, provided with at least a pneumatic pump, per se known, and with means for connecting the intake duct of said pump with said discharge connection of the lighter.

Keywords: Dredge-spoil transport; Hopper barge; Offshore mooring structure; Pump

U.S. Cl. X.R. 114-27; 141-312; 141-388; 214-13; 214-15B



3,981,549

PRODUCTION AND FLARE CAISSON SYSTEM

John P. Thomas, New York, N.Y., assignor to Interseas Associates, New York, N.Y.

Filed Apr. 27, 1973, Ser. No. 354,949

Int. Cl. E21b 43/02

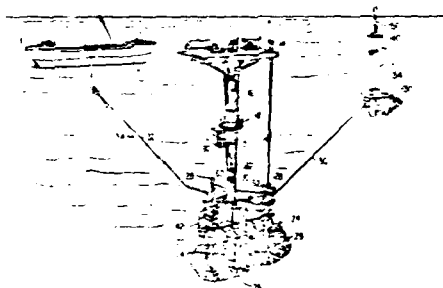
U.S. Cl. 166—5

10 Claims

A production and flare caisson system in which the caissons are anchored in the ocean floor by conductor pipes or piles extending into the ocean floor and rigidly attached to a template at the mud line. A spud rigidly attached to the template is imbedded into the floor through an opening generally centrally of the template, with the caisson being lowered into the spud and clamped thereto. In the production caisson a production separator and the production strings and flow lines are housed within the caisson thereby reducing the equipment normally stored on deck, or exposed to the marine environment. All components are prefabricated, preassembled, tested, and disassembled prior to being reassembled at the site. Installation can be effected by employing a drilling rig thereby eliminating the need for costly derrick barges.

Keywords: Offshore caisson; Offshore construction; Offshore platform, fixed; Seabed foundation; Seaweed oil, process structure

U.S. Cl. X.R. 61-46



3,881,840

CENTRIFUGAL PUMP FOR PROCESSING LIQUIDS CONTAINING ABRASIVE CONSTITUENTS, MORE PARTICULARLY, A SAND PUMP OR A WASTE-WATER PUMPER

Johan Henri Bunjes, Hengelo, Netherlands, assignor to Nera-tom B.V., The Hague, Netherlands

Filed Sept. 5, 1973, Ser. No. 394,490

Int. Cl. F04d 29/08, 29/10

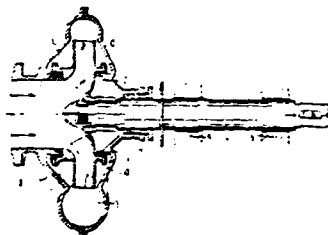
U.S. Cl. 415—109

8 Claims

A centrifugal pump for processing liquids containing abrasive constituents comprising a housing with a suction opening and a delivery opening and an impeller and having on either side sealing faces located at least partially on the outer side of a sealing slot in which slot, near the entrance side, an annular chamber is formed and means are provided for rotating the liquid in the chamber and near the outer circumference radial, outwardly directed ducts communicate with the annular chamber and open out by a diameter which is smaller than the diameter of the impeller.

Keywords: Dredge-spoil transport; Pump

U.S. Cl. X.R. 415-170A



3,882,320

**TIDE ENERGY CONVERSION DEVICE**

Edmund Schmeidler, Chewelah, Wash. 99109

Filed Dec. 20, 1973, Ser. No. 409,013

Int. Cl. F03b 13/12

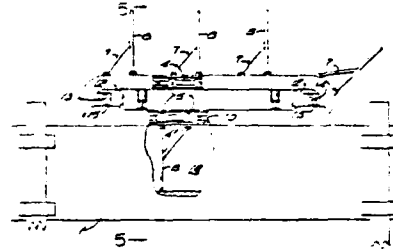
U.S. Cl. 290-43

3 Claims

A tide energy conversion device including a plurality of spaced apart pairs of parallel endless channel members elongated in the direction of tide flow and facing each other. The members include lower flights that are substantially horizontal and straight. Roller frames, each having two pair of spaced apart rollers, one pair in each channel of a pair of channels, carry elongated blades extending outwardly and transversely of the channels. These blades are connected to the frames by brace arms, each extending diagonally from the frame to locations adjacent the outer edge of a blade, and by support arms, each connected to an edge of a blade. The channel members are supported on a base which is secured at a level that supports the blades so they are at least partially submerged in the water while they are carried beneath the channels. Endless chains connect the several roller frames. The chains extend over longitudinally-spaced sprockets rotatably mounted on shafts. Force of the tide flow against the movable blades rotates the shafts which are connected to electrical generators. Gear reduction and transmission means is provided to enable the generators to produce electricity regardless of the directional movement of the blades.

Keywords: Electrical generator; Power, tide; Tidal inlet

U.S. Cl. X.R. 290-54



MAY 13, 1975

3,882,682

**FLOATING BOOM WITH DEMOUNTABLE FLOATS**

Harold R. Appelblom, 2310 Carlmont Dr., Belmont, Calif.

94002, and Francois Emile de Bourguignon, 1269 Ridgeley Dr., Campbell, Calif. 95008

Filed Apr. 16, 1973, Ser. No. 351,519

Int. Cl. E02b 15/04

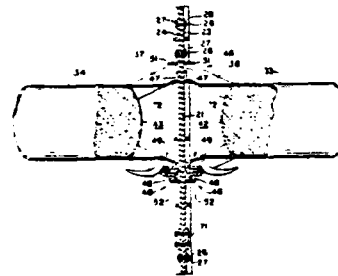
U.S. Cl. 61-1 F

7 Claims

A floating boom is disclosed which includes an elongated sheet-like partition member and a plurality of float means including float elements demountably secured to the partition member in relatively spaced apart positions thereon. The float elements are formed for rapid and easy attachment to frame members of the float means, which frame members are relatively permanently secured at predetermined positions along the length of the partition. The float elements are secured to the frame by arms which provide an outrigger type construction to enhance the stability of the boom and provide a channel between the float elements and the partition. Latch means is provided to enable selective coupling of the arms to the frame members.

Keywords: Pollutant, surface barrier

U.S. Cl. X.R. 61-5



3,883,261

POWER MEANS

Paul E. Saxmann, 6120 E. 21st St., Indianapolis, Ind. 46218  
Filed Aug. 13, 1973, Ser. No. 387,686  
Int. Cl. F03d 11/04

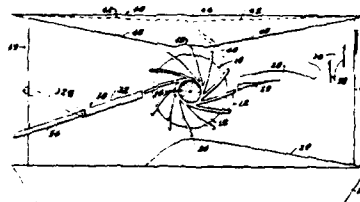
U.S. Cl. 415-7

4 Claims

A power means for obtaining useful power from moving fluid such as water waves or air motion, having an impeller body and an arrangement of baffle means for guiding the moving fluid to cause it to impart torque to the impeller.

Keywords: Power, wave

U.S. Cl. X.R. 415-202; 417-336



3,883,433

COLLECTION AND RECOVERY SYSTEM FOR OIL SPILLS

Frank Adams March, and Louis Stanislaus Brown, both of Reston, Va., assignors to Ocean Systems, Inc., Reston, Va.  
Continuation-in-part of Ser. No. 269,725, July 7, 1972, abandoned. This application Sept. 20, 1973, Ser. No. 399,339  
Claims priority, application Netherlands, July 4, 1973, 7309366

Int. Cl. E02b 15/04

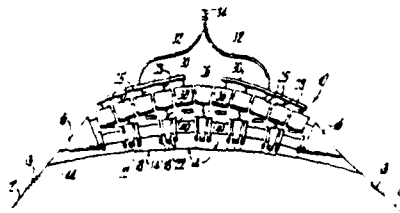
U.S. Cl. 210-242

11 Claims

Apparatus for collecting spilled oil with a plurality of rigid weir-plates disposed along a primary weir and supported by discrete weir-plate floats, each weir-plate having a weir opening, the weir-plates spaced from each other along the primary weir and connected to one another by flexible sheet. Embodiments of the invention additionally feature supporting the rear edge of the basin by discrete secondary floats spaced along the rear edge of the basin and connected by flexible sheet; stiffeners connected between the primary weir and the secondary floats; a plurality of secondary weirs supported on the secondary floats each secondary weir having a lip positioned beneath its associated secondary float; weir plates affixed to elongated weir plate floats at an angle so that they float stably with their lower edges aft of their upper edges; a perforation in the bottom of the basin; a tension line rigged forward of the primary weir and a plurality of bridles running between the tension line and the primary weir; bridles proportioned in length to deploy the primary weir along a parabolic line; a plurality of discrete floats along the primary weir intermediate to said weir plates and connected thereto by flexible sheet; floats made of a semiflexible closed cell foam coated with an elastomer outer coating; rigid stiffening plates affixed to the intermediate floats and attached to the forward edge of the basin, the stiffening plates extending downward from said intermediate floats to maintain said basin bottom at a predetermined depth in the water.

Keywords: Pollutant collection; Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.21



MAY 20, 1975

3,884,042

**FLOATING BREAKWATER**

Thomas R. Anderson, Stanwood, and Edwin E. Fortner, Everett, both of Wash., assignors to Cascade Pacific Rim Co., Inc., Arlington, Va.

Filed Jan. 2, 1974, Ser. No. 429,707

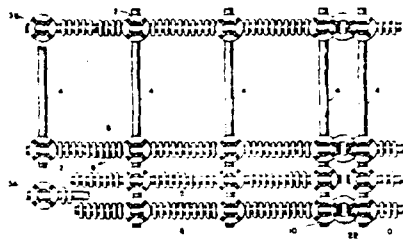
Int. Cl. E02b 3/06

U.S. Cl. 61-5

13 Claims

A floating breakwater fabricated of a plurality of interconnected sections extending across the front of an area desired to be protected from heavy seas. Each section is made up of a plurality of parallel linear floats with tires spacedly threaded to them and perpendicular floats serving as cross ties and forming a definitive structure. The links between the sections and the joints between the adjacent floats will be made of discarded automotive tires bolted together with no contact between the bolts and the floats thereby allowing the maximum of flexibility during times of high seas enabling the breakwater to absorb the resultant stress generated thereby without damage.

Keywords: Breakwater, floating; Low-cost shore protection; Tires



3,884,173

**SUPPRESSION OF CABLE STRUMMING VIBRATION BY A RIDGED CABLE JACKET**

Andrew G. Fabula, La Jolla, Calif., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed July 12, 1974, Ser. No. 487,832

Int. Cl. B63b 21/56; H01b 7/04; H02g 7/14

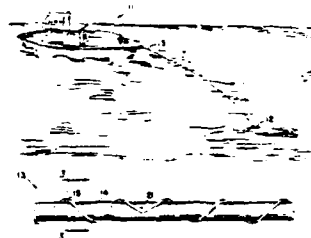
U.S. Cl. 114-235 F

20 Claims

An apparatus for the attenuation of motion induced, spurious, hydrophone signals resulting from cable vibrations induced by relative water flow motions over the cable, which are transferred to a hydrophone attached thereto, includes a radially outstanding and spirally disposed ridge or ridges running over that length of the cable that is exposed to flow with a sizeable cross-flow component.

Keywords: Towing cable

U.S. Cl. X.R. 174-42; 174-70R; 174-119R; 188-1B; 340-3T



3,884,807  
**APPARATUS FOR SKIMMING IN MULTI-PHASE FLUID MEDIA**

Merlyn W. Heddon, 8912 Victoria Ave., South Gate, Calif. 90280

Continuation-in-part of Ser. No. 29,783, April 20, 1970, abandoned. This application Oct. 18, 1971, Ser. No. 190,082 Int. Cl. E02b 15/04

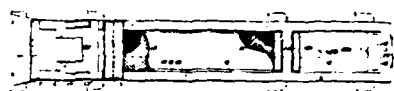
U.S. Cl. 210-104

1 Claim

A skimmer vessel is disclosed for collecting, automatically concentrating, and storing an upper phase of a two-phase liquid system such as oil floating upon water. A mechanically positioned entrance lip brings in a mixture of the two phases to a settling and collection zone. Within one or more settling zones connected in series electrical phase detection systems are used to facilitate optimum concentration of phases. The electrical systems automatically position weir gates and engage pumps for control of the phase separation. It is possible to operate the vessel under varying conditions, for example at low inlet rate provided by wave action, also at higher flow rates provided by mechanical pumping means or higher vessel surface velocities.

Keywords: Pollutant collection; Pollutant removal watercraft

U.S. Cl. X.R. 210-242; 210-DIG.21



MAY 27, 1975

3,885,330  
**EXCAVATOR FOR DIGGING A HOLE BENEATH THE WATER**

Toshinobu Araoka, 1308-1, Orio, Yahata-ku, Kitakyushu, Japan

Filed Mar. 7, 1973, Ser. No. 339,017  
 Int. Cl. E02f 3/92, 3/94

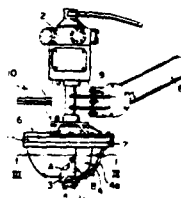
U.S. Cl. 37-57

3 Claims

Apparatus for digging a hole beneath the water comprises a submarine motor connected to drive a shaft carrying a plurality of scoops provided with teeth along their cutting edges. The scoops are mounted beneath a stationary disc provided with a hole connected to a suction pipe through which sand displaced by the scoops may be sucked up.

Keywords: Dredge, cutterhead; Dredge intake.

U.S. Cl. X.R. 37-64



AD-A080 797

COASTAL ENGINEERING RESEARCH CENTER FORT BELVOIR VA

P/O 13/2

AN ANNOTATED BIBLIOGRAPHY OF PATENTS RELATED TO COASTAL ENGINE--ETC(U)

NOV 79 R E RAY, M D DICKEY, A M LYLES

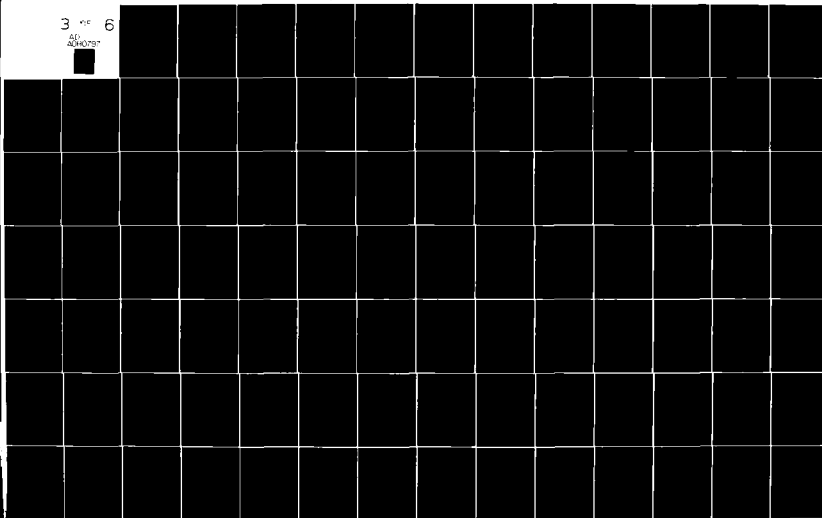
UNCLASSIFIED

CERC-NR-79-6-VOL-3-APP

NL

3 of 6

AD-A080797



3,885,331  
**DREDGING BARGE HAVING DIGGING JETS AND  
 STEERING JETS**  
 Thomas A. Mathieu, 2204 Justice St., Suite A, Monroe, La.  
 71201

Filed June 25, 1973, Ser. No. 373,140  
 Int. Cl. E02f 3/92, 5/28

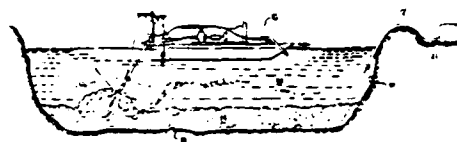
U.S. Cl. 37-63

4 Claims

A barge for removing material from the bed of a pond, lake or like body of water which includes a floating hull having opposite sides and ends with a manifold at one end mounted for pivotal movement about a horizontal axis and carrying a plurality of tubular pipes such that ends thereof may be positioned variably vertically relative to the material upon the bed to create a material-water admixture as well as providing forwarding propulsion to the hull, at least a pair of tubular pipes at a second end of the hull, the pair of tubular pipes being directed generally forwardly in the direction of forward propulsion and inclined relative to the horizontal, and the pair of tubular pipes each being pivoted for movement about a vertical axis to steer the barge.

Keywords: Dredge, suction; Dredge propulsion; Seabed trencher

U.S. Cl. X.R. 37-78; 114-151; 115-12R



3,885,418  
**METHOD AND APPARATUS FOR DETECTING THE  
 PRESENCE OF AN OIL SLICK ON A WATER SURFACE**  
 Anthony R. Kriebel, 340 La Mesa Dr., Menlo Park, Calif.  
 94025

Filed Oct. 17, 1973, Ser. No. 407,170  
 Int. Cl. G01n 1/14

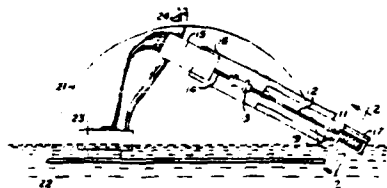
U.S. Cl. 73-61.1 R

18 Claims

An oil slick detector comprising a spinner located in a shroud surrounding the spinner and providing a radial gap between the spinner and the shroud, the spinner being driven at a constant speed by a motor, any changes in torque on the motor resulting in changes in the drive current of said motor, the free end of said spinner and shroud being positioned in the water surface such that the water and any oil on the water will enter the radial gap between the spinner and shroud, the torque on the motor being higher in value if oil is present than that torque on the motor if only water is present, said difference in torque resulting in a measurable change in the motor drive current. In a preferred embodiment, the spinner is provided with a spiral groove in its outer surface to encourage the flow of oil and water in the radial gap. By running the spinner first in a forward direction to move oil and water up the spinner and thereafter running the spinner in a reverse direction to move the oil and water off of the spinner, and by measuring the average motor current during the forward and reverse runs, a measurement related to the thickness of the oil slick is obtained.

Keywords: Buoy, instrumented; Pollutant measurement

U.S. Cl. X.R. 73-59; 340-236





3,885,440  
**FREE-GRAB DEVICE FOR COLLECTING UNDERWATER SAMPLES**

Andre Rossfelder, La Jolla, Calif., assignor to Le Nickel; Centre National pour l'Exploitation des Oceans, both of Paris, France and Tetra Tech Incorporated, Rosemead, Calif., part interest to each

Filed July 17, 1973, Ser. No. 379,940  
 Claims priority, application France, July 19, 1972, 72.26061

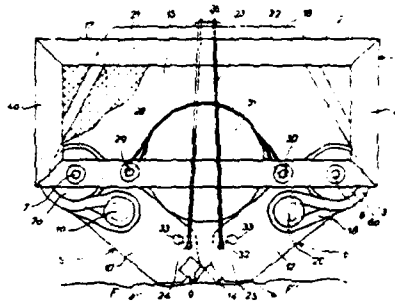
Int. Cl. G01a 1/06

U.S. Cl. 73-425.2

7 Claims

A free-grab device for collecting underwater samples. This device comprises a box-like frame, the bottom and two side faces of which are covered at least partially by an orificed wall, the other side faces being uncovered; two similar pick-up jaws which are fitted with scraping blades and which are pivoted on said frame to be displaceable between an open position in which they extend generally towards one another and a closed position in which they are in effective engagement with the uncovered side faces of the frame; return means acting on said jaws to urge them outwardly of said open position towards said closed position; releasable locking means acting on said jaws to lock them in said open position; and release means acting on said locking means to free said jaws when the device touches the sea-bed.

Keywords: Sampler, seabed grab



3,886,067  
**PROCESS FOR CONTROLLING OIL SLICKS**  
 Salvatore W. Miranda, P. O. Box 5746, Carmel, Calif. 93921  
 Filed Feb. 3, 1970, Ser. No. 8,198  
 Int. Cl. C02b 9/02; E02b 15/04

U.S. Cl. 210-40

15 Claims

Oil slicks on surface waters are controlled by applying oleophilic foam-material to the slick from a boat or airplane. In one case the material foams and binds the oil to form sponge-like clods which can be skimmed from the surface by another ship. In another embodiment chips of the film material which are formed on board the craft are applied to the oil slick.

Keywords: Pollutant absorption; Pollutant removal watercraft

U.S. Cl. X.R. 210-242; 210-DIG.21



3,886,070  
**METHOD FOR COMBATTING POLLUTION USING A CHROMIUM COMPLEX**  
 Jean Martineau, and Francois-Joseph Blechler, both of Paris, France, assignors to Seppic, Paris, France  
 Filed Feb. 16, 1973, Ser. No. 332,803  
 Claims priority, application France, Feb. 18, 1972, 72.05609

Int. Cl. B01d 11/00

U.S. Cl. 210-47

2 Claims

A process for anchoring a trivalent chromium complex, in which the chromium is co-ordinated to an acrylic carboxylic acid, to solid particles having a grain size of 1 to 600 microns by mixing 5 to 20 weight parts of said particles with one weight part of an aqueous alcoholic solution of said complex and heating the mixture to dryness. Products obtained by this process and their use in combating oil pollution of water.

Keywords: Pollutant absorption

U.S. Cl. X.R. 210-DIG.21

No Figure

JUNE 3, 1975

3,886,750

OIL CONTAINMENT APPARATUS

Ray R. Ayers, and Errol V. Seymour, both of Houston, Tex., assignors to Shell Oil Company, Houston, Tex.

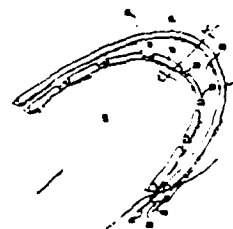
Continuation-in-part of Ser. No. 81,305, Oct. 16, 1970, abandoned. This application Apr. 24, 1972, Ser. No. 247,079  
Int. Cl. E02b 15/04

U.S. Cl. 61-1 F

15 Claims

Oil containment apparatus for use in water experiencing high current velocity which includes a barrier and means upstream of the barrier defining therewith a capture area where the flow velocity is locally reduced. Oil or other floating pollutant liquid enters the capture area and accumulates therein because of the inability of the low current velocity to remove the oil. Oil thus collected may be skimmed or otherwise removed from the capture area.

Keywords: Pollutant collection; Pollutant, surface barrier



3,886,751

AQUATIC CONSTRUCTION MODULE AND METHOD OF FORMING THEREOF

Mauricio Porraz Jimenez Labora, Bosque de Moctezuma No. 9, Mexico City, Mexico

Filed Nov. 12, 1973, Ser. No. 415,059  
Int. Cl. E02b 3/00, 7/08

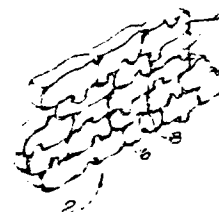
U.S. Cl. 61-3

6 Claims

A wall structure formed of a plurality of bags which can be stored in collapsible form and which expand when filled with an aggregate such as concrete. The bags have an inlet through which the aggregate can be inserted. The bags also have a portion which can interlock with an adjacent bag so as to prevent movement of the bags due to water energy, action or erosion. Reinforcing means such as rods or wire mesh can also be used in conjunction with the concrete. The bags can be stored and then rapidly filled at the site of a desired protective structure such as a dam, breakwater, or levee.

Keywords: Concrete form; Low-cost shore protection; Sandbag

U.S. Cl. X.R. 52-173; 52-594; 61-30; 61-37; 61-49



3,886,753

SUBMERSIBLE STRUCTURES

Jal Nariman Birdy, 61, Summit Rd., Northolt, Middlesex, and Shirley Bowers Stubbs, 3, Birkdale Rd., Ealing, London, W5, both of England

Filed Mar. 28, 1973, Ser. No. 345,757  
Claims priority, application United Kingdom, Apr. 4, 1972, 15546/72

Int. Cl. E02b 17/00 B65g 5/00; B65d 11/00

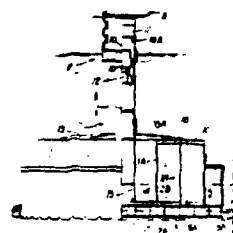
U.S. Cl. 61-46.5

12 Claims

A submersible structure floatable to a desired location and sinkable to rest on the water bed, comprising containers on a base, a perimeter wall on the base, and a column extending from the base to above water level, the containers, wall and column being formed of reinforced concrete.

Keywords: Offshore platform, fixed; Offshore storage tank, submerged; Seabed foundation

U.S. Cl. X.R. 61-50



194

3,887,817

POWER GENERATING DEVICE

Gerald E. Steelman, R.R. 3, Adel, Iowa 50003  
Filed Dec. 20, 1973, Ser. No. 426,804  
Int. Cl. F03h 13/10

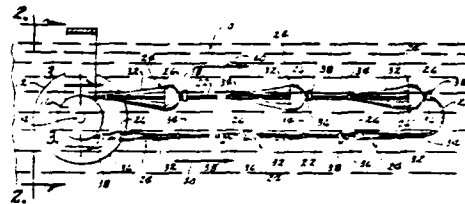
U.S. Cl. 290-43

11 Claims

Keywords: Power, tide

U.S. Cl. X.R. 290-54; 415-5

A power generating device comprises a continuous elongated flexible loop member having opposite loop ends and adapted to be suspended in a current of flowing fluid. The loop member is trained around a rotatable member which in turn is drivingly connected to an electrical generating power means. A plurality of flexible and collapsible containers or sails are mounted in spaced relationship and in end to end relationship along the loop member. When immersed in a current of moving fluid, the containers will be expanded and filled by the fluid when their open ends are facing upstream in relation to the current and they will be collapsed and emptied of fluid when their open ends are facing downstream in relation to the current. Thus the containers will drive the loop member and consequently the rotatable member continuously whenever the loop member and containers are immersed in a flowing fluid material.



3,887,897

SYSTEM FOR CHANGING SEISMIC DETECTION ARRAY LENGTHS

Edwin B. Neitzel, Dallas, and Marvin D. Gontarek, Richardson, both of Tex., assignors to Texas Instruments Incorporated, Dallas, Tex.

Filed July 23, 1973, Ser. No. 381,812  
Int. Cl. G01v 1/16

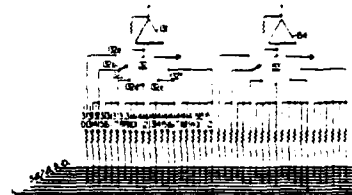
U.S. Cl. 340-7 R

10 Claims

Keywords: Seismic record processor; Seismic survey method

U.S. Cl. X.R. 340-15.5MC; 340-15.5GC

A system is disclosed wherein selections are available at a marine seismic survey boat which allows an operator to change the effective array length in integer multiples of the length of a unit array with array centers maintained constant while simultaneously introducing weighting which maintains constant the relative signal levels between channels.



JUNE 10, 1975

3,888,086

FLOATING BOOM

Gerald W. Robertson, Dumfries, and Terence Sturgeon, Lochbarbriggs, Dumfries, both of Scotland, assignors to Uniroval Inc., Newbridge, Midlothian, Scotland  
Filed Aug. 31, 1973, Ser. No. 393,359

Claims priority, application United Kingdom, Sept. 4, 1972, 40958/72

Int. Cl. E02b 15/04

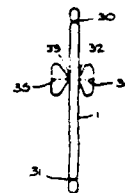
U.S. Cl. 61-1 F

8 Claims

A floating boom comprising a barrier for containing pollutant-debris along the surface of a body of water. The barrier is provided on each side thereof with oppositely directed bouyant members, and is ballasted along its lower longitudinally extending edge by means of an appropriate medium so that it maintains an upright attitude.

The foregoing abstract is neither intended to define the invention disclosed in the specification nor is it intended to be limiting as to the scope in any way.

Keywords: Pollutant, surface barrier



3,888,209

ARTIFICIAL REEF

Edmund R. Boots, 2310 Ocean Dr., Vero Beach, Fla. 32960  
Filed Nov. 14, 1973, Ser. No. 415,690

Int. Cl. A01k 61/00; E02b 3/04

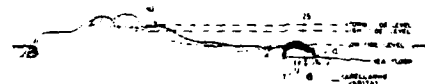
U.S. Cl. 119-1

4 Claims

A method and apparatus for preventing erosion of a beach, including an artificial reef for subsurface placement adjacent a shoreline and made up of a base reef set on the seabed and an upper reef preformed and mounted to the base reef or formed in situ on the base reef by a sabellariid marine organism thereby forming a composite reef to build up accretion of sand on the shore side of the reef and to prevent erosion of a beach.

Keywords: Bar protection; Breakwater, concrete; Seabed foundation

U.S. Cl. X.R. 61-3; 61-4; 119-4



3,888,317

HYDRAULIC PILE DRIVER

John E. Walters, Casson Lda., West Paterson, N.J. 07424  
Filed Mar. 27, 1974, Ser. No. 455,287

Int. Cl. E02D 7/14

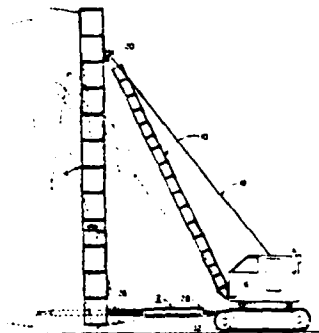
U.S. Cl. 173-43

5 Claims

A fully powered hydraulic pile driver whereby maximum desired movement and positioning of leads is accomplished under full hydraulic power, thus simplifying the pile driver mechanism and providing positive and precise control to the operator. A hydraulically powered telescoping spotter is provided whose connections to the lead frame and rig are also fully powered. Power monks are placed in the lead frame for plumbing and positioning the piles. A single hydraulic power system is provided to operate all the powered components.

Keywords: Pile driver leads

U.S. Cl. X.R. 52-115; 61-53.5; 214-147G



3,888,766

OIL SORPTION MATERIAL

Wayne J. De Young, Argos, Ind., assignor to Uniroyal, Inc.,  
New York, N.Y.

Filed Mar. 9, 1973, Ser. No. 340,613  
Int. Cl. E02b 15.04

U.S. Cl. 210-36

11 Claims

Keywords: Pollutant absorption

U.S. Cl. X.R. 106-2; 117-65.2; 117-93;  
117-138.8D; 134-6; 210-40; 210-DIG.21

Cellular materials impregnated with a hydrophobic and oleophilic sealant in an amount sufficient to coat the surfaces of the cells or capillary domains, for use in absorbing oil and like pollutants from the surfaces of either solids or liquids, are disclosed. In the preferred form of the invention, such a material is made by impregnating a sheet of open-celled polyurethane foam with a solution or latex of a sealant inert to water but capable of being swelled or dissolved by oil, drying the sheet by driving off all or part of the liquid medium, and compressing the sheet while the impregnated sealant is tacky, so that the sealant acts to retain the sheet in its compressed state. The resultant article is characterized by the unique quality of being relatively inactive when in contact with water, but becoming activated by oil, so that a rapid absorption of large amounts of the oil is effected. The cellular material may also be a foam in chopped or powder form, or a fibrous non-woven batt, and is particularly advantageous in selectively removing residual films of oil from the surface of a body of water. This abstract is not to be taken either as a complete exposition or as a limitation of the present invention, however, the full nature and extent of the invention being discernible only by reference to and from the entire disclosure.

No Figure

3,889,230

CAPACITIVE TRANSDUCER AND METHOD OF USING  
THE SAME

Sydney T. Knott, Barnstable; Frederick R. Hess, Waquoit, and  
Richard T. Nowak, North Falmouth, all of Mass., assignors  
to Woods Hole Oceanographic Institution, Woods Hole,  
Mass.

Filed Sept. 2, 1966, Ser. No. 576,979  
Int. Cl. G01v 1/38

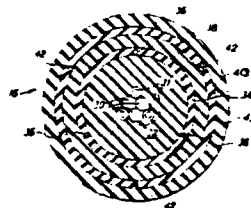
U.S. Cl. 340-17

9 Claims

Keywords: Seismic hydrophone; Seismic  
streamer cable

U.S. Cl. X.R. 340-7; 340-13

A capacitive type pressure sensitive transducer having the general form of a coaxial cable may be used as a continuous line hydrophone. The transducer has minimum sensitivity to pressure waves travelling parallel to its principal dimension, but high sensitivity in the directions normal to it. An inner conductive member is covered by a compressible cellular dielectric layer, over which is another conductive member of cylindrical configuration.



JUNE 17, 1975

3,889,403

**METHOD AND APPARATUS FOR CONTINUOUS UNDERWATER MINING USING PLURAL SHIPS**

Michel Gauthier, Renan; Marcel Tessier; Daniel Fleruy, and Michel Jegousse, all of Nantes, France, assignors to Centre National pour l'Exploitation des Océans and Le Nickel, both of Paris, France, part interest to each

Filed May 15, 1973, Ser. No. 360,594

Claims priority, application France, May 25, 1972, 72.18636

Int. Cl. E02f 5/00

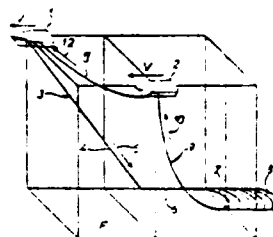
U.S. Cl. 37-69

8 Claims

Continuous extraction of solid products from the bottom of the sea by means of at least one endless dredging line provided with buckets. The endless line is lowered to the sea bed from a first ship, the buckets are caused to dredge the surface of the sea bed and the line is then raised to a second ship traveling along a generally parallel course to the first ship after the dredging operation is completed. The line is returned to the first ship along a return path which is at least partially submerged.

**Keywords:** Dredge, mechanical

U.S. Cl. X.R. 37-195; 43-4.5; 43-6.5; 214-13



3,889,476

**SUBMERSIBLE CAISSONS AND THEIR APPLICATIONS**

Gerald Gerin, 41 Avenue Egle, Maisons-Lafitte, France (78600)

Filed Feb. 2, 1973, Ser. No. 329,087

Int. Cl. E02d 5/00, 23/02

U.S. Cl. 61-46

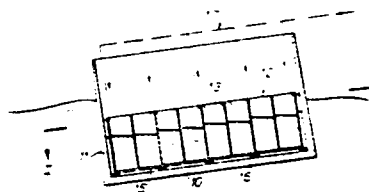
19 Claims

The invention relates to a submersible caisson adapted for use in the construction of sea or river works, of the kind comprising a bottom, at least one lateral wall and a dividing-up device for liquid ballast forming a cellular structure in section substantially parallel to said bottom. The said dividing-up device is a structure completely independent of the wall and the bottom of the caisson which can thus be calculated precisely in accordance with the applied stresses.

Many alternative forms of construction are given and the applications referred to are fluid-storage reservoirs, dykes, breakwaters, quay walls, lock walls, dam elements, etc.

**Keywords:** Breakwater, concrete; Offshore caisson; Offshore construction; Offshore storage tank, emergent

U.S. Cl. X.R. 61-46.5; 61-48; 61-50



3,889,477

# CRUDE OIL OFFSHORE STORAGE VESSEL

William A. Tam, Warrenville, Ill., assignor to Chicago Bridge & Iron Company, Oak Brook, Ill.

Filed Jan. 28, 1974, Ser. No. 436,905

Int. Cl.<sup>2</sup> B65G 5/00, B65D 89/10

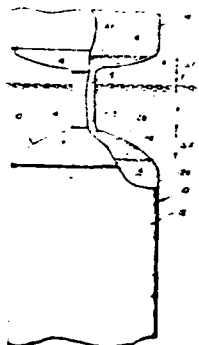
U.S. Cl. 61-46.5

10 Claims

A self-ballasting offshore oil storage tank comprises a vertical enclosure having a middle section with a cross-sectional area smaller than those of upper and lower sections joined thereto. The configuration of the upper and lower sections are made such that, with the middle section located at the water surface, oil stored within the vessel automatically apportions itself between the upper and lower sections in such a way that the weight of the oil stored in the upper section balances the buoyant effect of the oil stored in lower section.

Keywords: Offshore storage tank, emergent

U.S. Cl. X.R. 114-.5T; 220-85A



3,889,482

# JET SHEET AND CIRCULAR PILE WITH WATER HAMMER ASSIST

Leonard Long Frederick, 15 Crestview Ter., Whippany, N.J. 07981

Division of Ser. No. 293,444, Sept. 29, 1972, Pat. No. 3,822,557. This application May 10, 1974, Ser. No. 469,026

Int. Cl.<sup>2</sup> E02D 7/18, 5/16

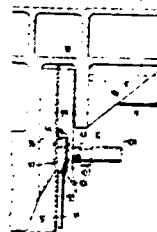
U.S. Cl. 61-53.5

8 Claims

The invention relates to a system of furnishing a supply of lubricant to the opposed sides of a section of piling and a movable drive shoe carried thereby to facilitate the driving of the piling in any type of earthen strata.

Keywords: Pile driver, vibratory; Pile driver, water jet; Pile-driving shoe; Pile, sheet; Pile, steel

U.S. Cl. X.R. 61-53.74; 61-60; 61-61; 173-49



3,890,224

# PROCESS FOR CONTROLLING SURFACE POLLUTANTS

Donald Eric Weiss, Blackburn, and Hendrik Adriaan Jacobus Battaerd, North Clayton, both of Australia, assignors to Commonwealth Scientific and Industrial Research Organisation and Imperial Chemical Industries of Australia and New Zealand Limited, Campbell, Australia

Filed Apr. 29, 1971, Ser. No. 138,679

Claims priority, application Australia, May 4, 1970, 1083/70

Int. Cl. C02b 9/02; E02b 15/04

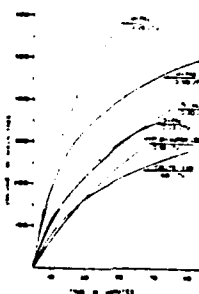
U.S. Cl. 210-30

11 Claims

A method of phase separation using ferromagnetic materials. A mixture of phases is treated with particles or granules of ferromagnetic material so that one of the phases is preferentially absorbed or collected onto or into the particles or granules. The particles or granules of the ferromagnetic material together with the absorbed or collected phase may then be recovered from the remainder of the mixture using magnetic means.

Keywords: Pollutant absorption

U.S. Cl. X.R. 210-36; 210-40; 210-75; 210-223; 210-DIG.21



3,890,234

# OIL SEPARATION AND RECOVERY DEVICE

Frank Galicia, 5043 Catherine St., Philadelphia, Pa. 19143  
 Filed Apr. 18, 1973, Ser. No. 352,209  
 Int. Cl. E02b 15/04

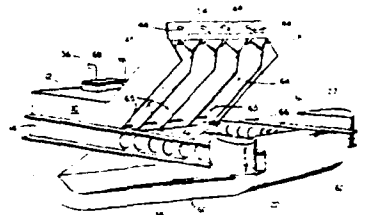
U.S. Cl. 210-242

1 Claim

An oil separation and recovery device which may be towed or otherwise propelled over, or left stationary on, the surface of a body of oil polluted water. If the unit is in motion, inverted V-shaped troughs intersect the liquid surface causing the oil polluted water to flow into an inner chamber as the oil rises to the trough vertices. If stationary, high pressure water is used to force the oil polluted water along the troughs to the inner chamber as a vacuum is created. In either case, but particularly the latter, the contaminated water flow path is improved by utilizing depolluted discharging water to induce a surface current of the oil polluted water to flow toward the troughs. Also, the utilization of a heating means keeps the oil flowing expeditiously through the troughs.

Keywords: Pollutant collection; Pollutant, suction removal

U.S. Cl. X.R. 210-194; 210-DIG.21



3,890,593

# MULTI-DIRECTIONAL SEISMIC EXPLORATION METHODS ON NAVIGABLE WATER

JLee Davis, Ector, Tex., assignor to Advance Oil and Gas Co.,  
 Inc., Midland, Tex.  
 Continuation-in-part of Ser. No. 145,811, May 21, 1971, Pat.  
 No. 3,746,122. This application June 28, 1973, Ser. No.  
 374,497

Int. Cl. G01v 1/28

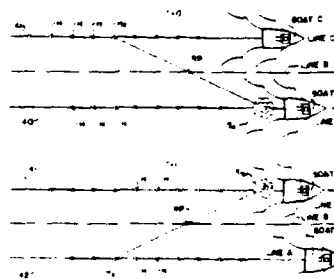
U.S. Cl. 340-15.5 MC

2 Claims

A number of seismic detectors are located in a two-dimensional array on the surface of the earth, either on land or at sea. One or more seismic disturbances are produced in the vicinity of the seismic detectors at points located to produce sampling of various subsurface reflection points to form one or more two-dimensional areas of coverage. For each seismic disturbance, the subsurface reflections thereof received by the various seismic detectors are recorded. In some embodiments, the seismic disturbances are produced at points located to produce multi-directional sampling of each of various subsurface reflection points and recordings for different ones of the seismic disturbances are combined to produce stacked recordings wherein multi-directional reflections from common subsurface points are added. On navigable water the multi-directional sampling is conducted by traversing a region to be surveyed with two vessels on generally parallel courses each towing a string of hydrophones, and alternately creating seismic disturbances in the water adjacent each vessel to thereby sample a plurality of reflecting points located along a line which tracks the planned survey line well notwithstanding deviations in the courses of the vessels and hydrophones caused by water currents and navigational errors.

Keywords: Seismic survey method

U.S. Cl. X.R. 340-7R; 340-15.5R





JUNE 24, 1975

3,890,790

ANTI-HEAVE PROTECTIVE SYSTEM

Jacques Edouard Lamy, Fontenay-aux-Roses, France, assignor to C. J. Doris, Paris, France

Continuation of Ser. No. 324,305, Jan. 17, 1973. This application May 21, 1974, Ser. No. 471,878

Claims priority, application France, Jan. 18, 1972, 72.01560

Int. Cl. E02b 3/06

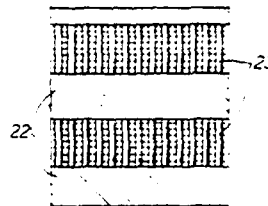
U.S. Cl. 61-3

6 Claims

Keywords: Seawall

U.S. Cl. X.R. 61-4; 61-46; 61-49

Anti-heave protective system including especially designed means adapted to slow down ascending and descending water flows against an obstacle exposed to wave and heave action. These means include material elements such as studs, blade portions or pipe portions, constituting in front of the obstacle, projecting energy dissipating elements over a depth sufficient to penetrate beyond the limit layer of the water mass moving upwards and downwards against the obstacle, and the obstacle comprises a plurality of columns, horizontal drums or the like, arranged in staggered relation to provide a substantially uninterrupted impingement area for the waves.



3,890,794

METHOD OF REPLACING PILING

John T. Broadfoot, Star Rte. 1, Box 144, Kingston, Wash. 98346

Filed Dec. 26, 1972, Ser. No. 318,093

Int. Cl. E02d 5/26, 5/40

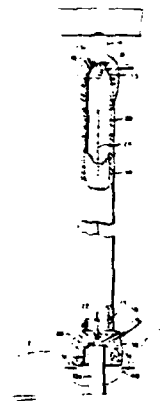
U.S. Cl. 61-54

10 Claims

Keywords: Pile, concrete; Pile section connection; Pile, structure connection; Pile, wood; Structure repair

U.S. Cl. X.R. 52-722; 52-725; 61-48; 61-56.5; 425-90

Deteriorated piling is replaced with a hollow, tubular, reinforced concrete column extending from just below the mud line to the underside of a load-bearing member supporting an overhead structure. The deteriorated piling is severed below the mud line and a cast-in-place concrete column is positioned between the severed piling and the overhead supporting member. Any required length of column is formed by suspending a preformed base section in water over the severed piling, securing a form member to the top edge of the base section, spraying quick-setting concrete over the form member, which sets in seconds, and adding progressive additions of form member and concrete while lowering the hollow column into place over the severed piling until contact is made with the overhead structure. An integral, hollow concrete column is formed functioning as a load-bearing piling.



3,890,795

**KIT OF COMPONENTS AND A METHOD OF  
PROTECTING STEEL PILING FROM CORROSION**

John R. Maurer, Glendora, Calif., assignor to Walter A. Phummer, Sherman Oaks, Calif.

Filed May 21, 1973, Ser. No. 362,170

Int. Cl. E02d 5/60

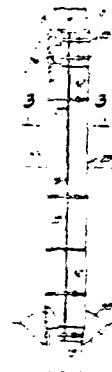
U.S. Cl. 61-54

13 Claims

A protective jacket kit for and a method of safeguarding steel piling against corrosion. The H-beam type piling is sheathed with a tough flexible plastic jacket equipped with an interlocking plastic seam and is snugly gathered and cinched about the piling and certain underlying auxiliaries. These important auxiliaries include clip-on closure members for the open sides of the piling and providing support for the jacket along the open sides of the piling and preventing contact of the jacket with the sharp and rough outer corners thereof. Additional auxiliaries include barrier blocks effective to close at least the upper and, in some cases, the lower ends of the open sides of the piling as well as a sealing collar embracing the barrier blocks.

**Keywords:** Coating; Corrosion prevention; Pile, steel

U.S. Cl. X.R. 24-197; 52-170; 52-724; 52-728; 52-623



3,890,840

**LASER CONTROLLED FATHOMETER**

Richard J. Malloy, Ojai, Calif., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed June 7, 1974, Ser. No. 477,250

Int. Cl. G01b 11/26; G01H 23/00

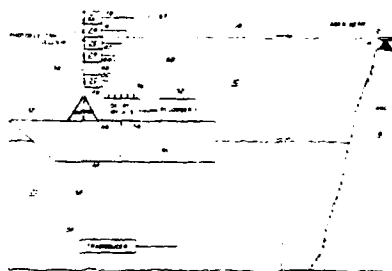
U.S. Cl. 73-290 V

7 Claims

In a method and apparatus for underwater depth recording, a laser beam placed on a datum point impinges upon a plurality of vertically adjacent laser beam receptor cells rigidly affixed to a float. A depth sounding transducer is supported a fixed distance under the float and communicates with a recorder. A plurality of delay circuits respectively connected to the plurality of receptor cells delays a signal from the transducer to the recorder a specific time indicative of the position of the plurality of receptor cells with respect to said datum point whereby an underwater depth recording is made without errors being introduced by surface water disturbances.

**Keywords:** Instrument, laser; Sonar, depth sounder

U.S. Cl. X.R. 73-432L; 340-3R; 356-172



3,890,844

**PERIPHYTON SAMPLER AND METHOD FOR SAMPLING**

William F. Gale, River Rd., Wapwallopen, Pa. 18660

Filed July 25, 1974, Ser. No. 491,694

Int. Cl. G01h 1/02

U.S. Cl. 73-421 R

8 Claims

Keywords: Instrument deployment; Sampler, biota

U.S. Cl. X.R. 73-425

A sampling device is disclosed which is capable of being clamped to the surface of a stone and other portable solid underwater objects to which periphytic cells adhere and which will retain the sample cells in a closed container, while the object, sampling device and cells are transported as a unit to a laboratory or other place of testing. The device includes a hollow body having a top, a bottom, and an integral annular side wall connecting top and bottom, an aperture in the bottom and a rigid tubular collar extending from the margin defining the aperture, a sealing collar surrounding the rigid collar, and adapted to sealingly engage the surface of the object being sampled with the hollow body. A stoppered access opening is provided in the top of the hollow body for inserting a cleaning implement for removing periphytic cells from the solid object. A clamp is provided for clamping the hollow body to a solid object in sealed engagement therewith.



3,890,916

**FENDER FOR MOORING POSTS OR THE LIKE**

Josef Tummers, Heimgarten, and Walter Pisarik, Hattingen, both of Germany, assignors to Mannesmannrohren-Werke Aktiengesellschaft, Dusseldorf, Germany

Filed Sept. 24, 1973, Ser. No. 399,930

Claims priority, application Germany, Sept. 22, 1972, 2247197

Int. Cl. B63B 59/02

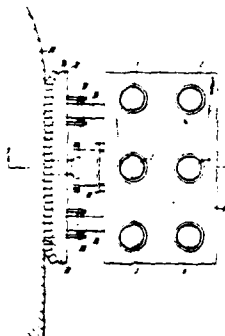
U.S. Cl. 114-219

2 Claims

Keywords: Pier fender

U.S. Cl. X.R. 61-48

A fender of a mooring post is held thereon by a ball and socket mount permitting pivoting on a vertical and on a horizontal axis. The fender is secured against rotation on an axis transverse to the surface of the fender provided for engaging a ship.



3,890,917

# MARINE FENDERS

John Morton Ackroyd, Windsor, and Graham Arthur Nigel Hart, Aylesbury, both of England, assignors to Firestone Burleigh Marine Pneumatic Fendering Company Limited, Middlesex, England

Continuation-in-part of Ser. No. 218,892, Jan., 1972, abandoned. This application Dec. 20, 1973, Ser. No. 426,697  
Claims priority, application United Kingdom, Jan. 19, 1971, 2685 71

Int. CL B63b 21/04

U.S. CL 114-220

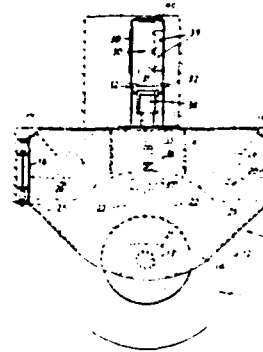
10 Claims

A marine fender for use on dock walls and at lock entrances comprises a wheel equipped with a pneumatic tire and mounted on a vertical axle in a supporting structure. Two rollers are mounted on vertical axles in the supporting structure, and the wheel axle can slide at right angles to its own length to allow the tire to be pressed into resilient deforming engagement with the rollers. This inward movement, and the return movement, of the wheel are yieldingly resisted by hydraulic rams attached to the wheel axle, and the flow of the hydraulic fluid of the rams during the instroke of the rams is controlled by a control device incorporating a restrictor the effective restriction of which is reduced as the instroke proceeds. This causes a rapid increase

Keywords: Pier fender; Tires

U.S. CL. X.R. 61-48

in the fending force exerted by the wheel during its initial inward movement, and a subsequent levelling off of this force as it approaches its maximum permissible value during the remaining part of the inward movement.



3,891,037

# REMOTELY OPERATED SEAFLOOR CORING AND DRILLING METHOD AND SYSTEM

Dale E. Well, 3902 Lincolnshire St., Pascagoula, Miss. Calif. 39567, and Kenneth C. Marley, 1074 Valley Forge Dr., Sunnyvale, Calif. 94087

Filed Dec. 26, 1972, Ser. No. 318,114

Int. CL<sup>2</sup> E21B 7/12

U.S. CL 175-6

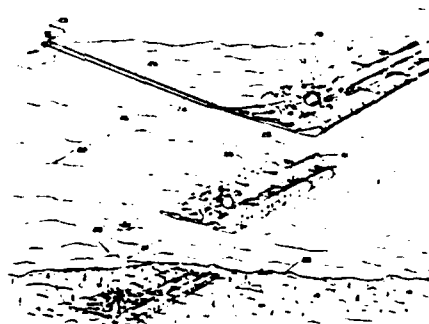
3 Claims

Method and apparatus for emplacing a structure such as a casing, piling or core barrel into the floor of a body of water, hereafter referred to as sea floor. The structure is mounted on a towable and submersible vessel which includes a number of ballast tanks, and means are provided to selectively vary the ballast in certain ones of the tanks in a manner causing the vessel to have selectively controllable negative or positive buoyancy for descent or ascent, respectively, to or from the sea floor. A support device on the vessel is adapted to move the structure between a horizontal orientation for towing and descent and an upright position for drilling, after the vessel reaches the sea floor. The vessel descends with a positive metacenter to maintain the established orientation until it reaches the sea floor, after which it is anchored and leveled for commencing the drilling operation. The structure is advanced into the floor through increments of drilling strokes by means of rotating, through oscillatory or continuous rotary motion, a clamping mechanism which is engaged at incremental positions along the length of the structure. Means are provided to control the thrust force between the drilling end of the structure and the sea floor. An umbilical cable supplies power and control functions from a surface ship to the submerged vessel. Water under pressure is circulated

Keywords: Embedment anchor; Instrument deployment; Pile placement; Sampler, seabed-drilled core

U.S. CL. X.R. 61-46; 61-46.5; 61-53.5; 173-152

through the interior volume of the structure to carry cuttings material away from the cutting end. Following completion of the drilling operation grout material is pumped into the void spaces between the structure and sea floor. The vessel is recovered for subsequent use by disengaging the clamping mechanism from the structure and blowing selective ones of the ballast tanks to cause the vessel to have positive buoyancy.



3,891,845

**WET ENVIRONMENT RADIOGRAPHY APPARATUS**  
Paul Nelson English, 2741 Iowa St., Baton Rouge, La. 70802  
Filed Dec. 18, 1972, Ser. No. 315,914  
Int. Cl. G03b 4/116

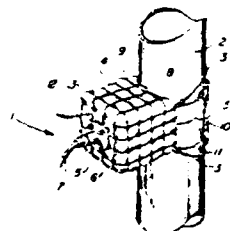
U.S. Cl. 250-321

5 Claims

**Keywords:** Instrument, radioisotope; Pile, steel; Structure inspection

U.S. Cl. X.R. 250-358; 250-508

A wet environment radiography apparatus attachable to the exterior surface of an object which is to be radiographed where the exterior surface is in a wet environment.



JULY 1, 1975

3,892,075

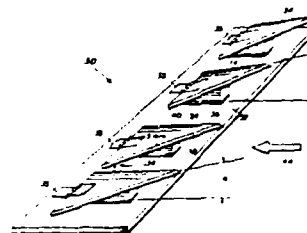
**APPARATUS FOR VORTEX GENERATION TO PRECIPITATE SUSPENDED PARTICLES IN FLUID BODIES**  
Michael Edward Tibbett, 1035 - 33rd St., Vero Beach, Fla. 32960  
Filed Oct. 29, 1973, Ser. No. 410,788  
Int. Cl. E02b 3/04

U.S. Cl. 61-4

6 Claims

**Keywords:** Bar protection; Breakwater, steel frame

A vortex generator, for example a delta hydrofoil, is positioned within a fluid body so as to generate vortices and thereby precipitate suspended particles.



3,892,079

**CONTROL SYSTEM FOR AMPHIBIOUS HYDRAULIC EXCAVATOR**  
Kinichi Hirano, Tsuchiura, and Yoshiaki Metsugi, Tokyo, both of Japan, assignors to Hitachi Construction Machinery Co., Ltd., Japan  
Filed Dec. 26, 1972, Ser. No. 318,700  
Claims priority, application Japan, Dec. 27, 1971, 46-105322

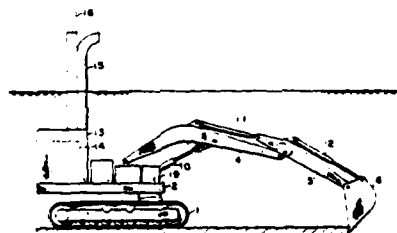
Int. Cl. E02f 3/32, 5/28  
U.S. Cl. 37-56

1 Claim

**Keywords:** Seabed grader; Seabed trencher

U.S. Cl. X.R. 37-71; 37-DIG.1; 60-DIG.2; 91-411R; 91-459; 180-98; 214-138R; 214-DIG.2

An amphibious hydraulic excavator, comprising an amphibious crawling truck, a revolving platform rotatable on said crawling truck, a shovel assembly mounted on said revolving platform and composed of a boom, arm and bucket, hydraulic actuator means for driving said mentioned parts of the excavator, and a prime mover installed on said revolving platform, characterized in that said mentioned parts are fabricated water-tight while said prime mover being provided with a schnorkel or breathing mast for use of air suction and exhaust, thereby enabling the excavator to be operated under water.



3,892,130

# DEEP SEA MICROBIOLOGICAL SAMPLING AND CULTURING APPARATUS AND METHOD

Clifford L. Winget; Kenneth W. Doherty, both of Woods Hole,  
and Carl O. Wirsén, Pocasset, all of Mass., assignors to  
United States of America as represented by the Secretary of  
the Navy, Washington, D.C.

Filed Feb. 11, 1974, Ser. No. 441,729

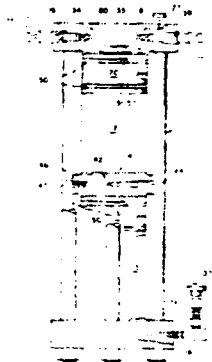
Int. Cl. G01N 7/12

U.S. Cl. 73-425.4 R

5 Claims

A microbiological specimen sampler is presented which provides for the sterile recovery of microorganisms such as bacteria, fungi and yeast from ocean depths in undamaged form. The sampler comprises two substantially identical chambers axially aligned and separated by a port block. Each chamber contains a free floating piston, the pistons being initially disposed in the same respective position in the chambers. One chamber is virtually filled with a snubbing fluid between the port block and its floating piston while the other chamber is initially pressurized with a gas. At a preselected position and depth a valve is opened which admits seawater into the sampler forcing one floating piston to drive snubbing fluid through the port block against the other floating piston which compresses the gas in its chamber as sample fluid is admitted into the first chamber. The specimen sample is locked in the first chamber when flow ceases. The sample can be removed or other media can be injected into it by means of a transfer block which may now be secured to the valved end of the sampler.

Keywords: Sampler, biota; Sampler, water



3,893,065

# HYDROPHONE ARRAY

John D. Lea, Huntington, and George Rand, Franklin Square,  
both of N.Y., assignors to Sperry Rand Corporation, New  
York, N.Y.

Filed Dec. 5, 1973, Ser. No. 422,125

Int. Cl. G01v 1/38, H04b 13/02

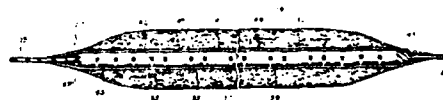
U.S. Cl. 340-8 MM

8 Claims

An elongated hydrophone array of the type adapted to be towed behind a marine vessel includes a flexible tubular casing in which a chain of acoustic sensors is mounted. A drogue attached to the trailing end of the array serves to maintain the array in a streamer-like horizontal attitude during normal use. An acoustically transparent sheath of open-pore polyurethane foam surrounds the portion of the array in which the sensors are mounted so as to maintain the noise-producing turbulent boundary layer of water that occurs at the array-water interface at a considerable distance from the actual sensors.

Keywords: Seismic hydrophone array; Seismic streamer cable

U.S. Cl. X.R. 174-110F; 340-3T; 340-7R;  
340-8FT



JULY 8, 1975

3,893,249

**SUCTION DREDGER WITH SWELL COMPENSATION**  
Tjako Aldrik Wolters, 53, Kastanjelaan, Vianen, Netherlands  
Filed Jan. 30, 1974, Ser. No. 437,761  
Claims priority, application Netherlands, Feb. 2, 1973,  
73.01503

Int. Cl. E02f 3/90

U.S. Cl. 37-58

12 Claims

The tension load on the cable suspending the nozzle and conduit of a suction dredger is reduced by employing one or more reversing sheaves at the nozzle with multiple cable passes thereover. In order to "sling" the nozzle end pulleys or sheaves and avoid movement between the slinging cable portions and the nozzle end pulleys as swell compensation is effected, the slinging pairs of cable portions are guided and maintained side-by-side and are acted upon in unison by the swell compensation device.

Keywords: Dredge, suction; Dredge ladder control

U.S. Cl. X.R. 37-72; 175-5; 254-172; 254-189



3,893,304

**METHOD AND A DEVICE FOR THE UNDERWATER CONSTRUCTION OF CONCRETE STRUCTURES**  
Leonid Pochitaloff-Huvale, and Alexandre Dombay, both of Paris, France, assignors to Leonid Pochitaloff-Huvale, Paris, France

Filed June 28, 1973, Ser. No. 374,506

Claims priority, application France, July 21, 1972,  
72.26360

Int. Cl. E02d 27/38, 29/00

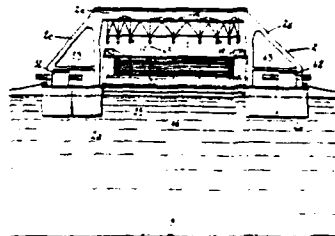
U.S. Cl. 61-46

25 Claims

A flexible and leak-tight jacket having an internal space which corresponds to the casting space of the underwater structure is placed in position at the construction site. at least part of the internal space is filled with liquid ballast in order to subject the jacket walls to a pressure which is higher than the ambient hydrostatic pressure, and concrete or hardenable material is finally poured into the jacket while the liquid ballast is discharged.

Keywords: Concrete form; Fabric mat; Offshore construction; Offshore platform, fixed; Seabed material placement

U.S. Cl. X.R. 52-426; 61-43; 61-46.5;  
61-72.1; 249-1; 249-31



3,893,404

**PULL-AHEAD WINCH CONTROL SYSTEM**

William R. Chandler, Sedro-Woolley, Wash.; Donald R. Cooper, North Hollywood, Calif., and Edward J. Mangold, Burlington, Wash., assignors to Skagit Corporation, Sedro-Woolley, Wash.

Filed Mar. 25, 1974, Ser. No. 454,506

Int. Cl. B63h 15/00

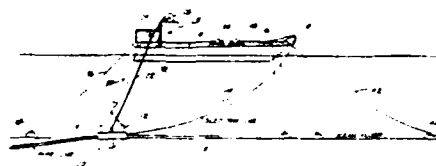
U.S. Cl. 115-7

9 Claims

A control system is provided for a pull-ahead winch used on a barge which digs a trench on the floor of a body of water and lays pipe in the trench. The trenching device or jet sled is suspended from the barge and is supplied with air and water at considerable force which are used to displace the bottom soil to dig the trench. The jet sled is pulled along a desired path by means of a cable, usually of fixed length, extending from a winch on the barge, and forward movement is supplied by one or more pull-ahead winches which reel in on a forwardly extending cable at a desired rate to permit the trench to be of the desired depth. Sled cable tension is controlled to a desired value by sensing this tension and producing an electrical signal proportional thereto, modifying this signal in a signal-shaping circuit comprising a second order lead-lag filter and comparing the modified signal with a tension reference signal to produce an error signal. The error signal is further modified by a signal representative of velocity and direction of movement of the pull-ahead cable. This modified error signal is then amplified and supplied to an electrically controlled clutch which controls the drive to the pull-ahead winch.

Keywords: Seabed pipeline placement; Seabed trencher; Tow winch control

U.S. Cl. X.R. 61-72.4; 114-144E; 318-6R



3,893,539

**MULTIPLE AIR GUN ARRAY OF VARIED SIZES WITH INDIVIDUAL SECONDARY OSCILLATION SUPPRESSION**

Lewis M. Mott-Smith, Houston, Tex., assignor to Petty-Ray Geophysical, Inc., Houston, Tex.

Continuation of Ser. No. 291,881, Oct. 21, 1972, abandoned.

This application Sept. 28, 1973, Ser. No. 401,856

Int. Cl. G01v 1/02

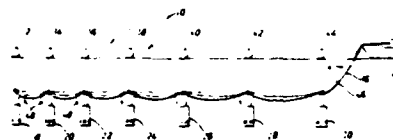
U.S. Cl. 181-115

11 Claims

An underwater seismic source for generating an improved seismic signal employing a spaced array of air guns of different sizes to generate an initial bubble impulse and to suppress the cumulative effect of secondary bubble impulses. The combination includes means for providing further secondary bubble suppression integral with one or more of the guns in the array. The sizes, minimum spacings, and secondary bubble suppression techniques are intimately combined to provide an underwater seismic source having an acoustic pressure signature wherein the amplitude of the initial impulse, including the signal reflected from the water surface, is from eight to twelve times the amplitude of any subsequent bubble impulses, including their surface reflections.

Keywords: Seismic acoustic transmitter array; Seismic explosive acoustic transmitter

U.S. Cl. X.R. 181-120; 181-111; 340-7R





3,894,241  
**WAVE ACTION POWER SOURCE**  
 Saul Kaplan, 405 Highland Ave., Merion, Pa. 19066  
 Filed Mar. 8, 1974, Ser. No. 449,248  
 Int. Cl. F03b 13/12

U.S. Cl. 290-42

5 Claims

Keywords: Power, wave

U.S. Cl. X.R. 290-53

A power source which is powered by the energy in water waves has a frame which supports a shaft above the waves. A large number of floats are constrained by the frame to be moved up and down under the shaft by the waves. Above each float a first pulley having a first releasable ratchet and a non-releasable ratchet has a chain pass over it to hold a first weight at one end. On each float there is mounted a second pulley which engages the other end of the chain, the second pulley having a second releasable ratchet. Each chain passes through a passage in a float to terminate at a second lighter weight. As waves move each float up, a second releasable ratchet allows its second pulley to turn. As each float moves down, it pulls a chain about a first pulley raising a first weight, a first releasable ratchet allowing its first pulley to turn and a non-releasable ratchet allowing it to turn without rotating the shaft. As each first weight reaches a desired height, a means releases both releasable ratchets to drop each first weight to turn the shaft by means of the first pulley and the non-releasable ratchet. Sufficient floats and associated weights and apparatus ensure that the shaft will be constantly turned by falling weights to provide a power source.



JULY 15, 1975

3,894,397  
**BEACH EROSION CONTROL STRUCTURE**  
 Samuel S. Fair, 3105 Old Kawkawlin Rd., Bay City, Mich. 48706

Filed Aug. 5, 1974, Ser. No. 494,845  
 Int. Cl. E02h 3/06

U.S. Cl. 61-4

15 Claims

Keywords: Breakwater, concrete; Concrete block; Low-cost shore protection; Seawall

U.S. Cl. X.R. 52-584; 52-593; 61-37

Beach erosion control structures comprising a perforate wall designed to combat erosion of a beach shoreline by wave action. The wall includes multiple courses of cored concrete blocks laid on their side so that the core holes provide horizontal passageways through the wall for the flow of water and entrained sand in incoming waves. The wall also includes multiple rows of such blocks arranged in such manner that the core holes of adjacent rows of blocks are staggered.

A beach erosion structure according to the invention comprises a wall composed of individual, cored concrete blocks arranged in multiple rows and courses. The blocks of each row are arranged end-to-end and parallel to the adjacent row or rows, but the blocks of each row are longitudinally offset so that the core holes of adjacent rows of blocks are out of register. In some instances the blocks are preassembled by securing individual blocks into like block units, each block unit having a plurality of blocks (three blocks in the usual case) assembled in a longitudinally staggered side-by-side relationship such

that the core holes in adjacent block are offset. By offsetting a central block longitudinally of the outer blocks, tongue and groove interlocks between adjacent block units within the wall can be achieved. Such a wall may be laid up without the use of mortar. Instead, mechanical fastening means, such as crimped straps, may be employed to couple adjacent courses to each other. Some or all of the block openings may be provided with reed or flapper-type valves which are swung open by an incoming wave, and then move to a partially closed position to resist or restrict the flow of water in ebbing waves. A sheet metal footing may be employed to provide and maintain a general horizontal alignment between adjacent block units in the lowermost course.



(20)

3,894,401

# SAND FILL COMPACTION SYSTEM

Cort T. Johnson, Long Beach, Calif., assignor to City of Long Beach, Long Beach, Calif.

Filed July 5, 1974, Ser. No. 486,178

Int. Cl.<sup>2</sup> F16L 1/00 E02F 5/12

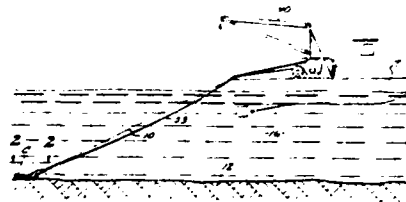
U.S. Cl. 61-72.4

11 Claims

A system for effecting underwater compaction of submerged sand. The system utilizes a towboat that drags a vibratory compactor slowly over the sea floor as dredged sandy material is deposited. The travel route and speed of the towboat and compactor are coordinated with the dredge discharge rate and discharge location whereby the compactor completes one pass over the entire fill area for each predetermined increment of fill depth.

Keywords: Dredge-spoil transport; Seabed material placement; Seabed soil treatment

U.S. Cl. X.R. 61-63



3,894,504

# ICE CUTTER FOR MONOPOD DRILLING PLATFORM

Charles H. Smith, Glendale, Calif., assignor to Sea-Log Corporation, Pasadena, Calif.

Filed Apr. 8, 1974, Ser. No. 459,029

Int. Cl. B63b 35/12

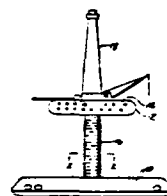
U.S. Cl. 114-42

8 Claims

A monopod drilling platform having cylindrical structural column extending vertically between a drilling deck and a submerged base in which a concentric sleeve surrounds the column and is rotatably supported from outside of the sleeve, the sleeve having ice cutter arms projecting radially from the outer surface thereof. Both axial thrust and centering of the sleeve are provided by a plurality of rollers mounted around the outside of the sleeve, the roller engaging a conical surface projecting outwardly from the sleeve. The rollers are individually adjustable and removable without interrupting rotation of the sleeve by drive means mounted on the deck.

Keywords: Ice protection; Offshore platform, fixed; Offshore platform, leg; Offshore structure fender

U.S. Cl. X.R. 61-46; 299-24



3,894,567

# OFFSHORE VESSEL MOORING

George E. Mott, Metairie, and Lynn J. Ratcliff, Gretna, both of La., assignors to Texaco Inc., New York, N.Y.

Continuation of Ser. No. 886,140, Dec. 18, 1969, abandoned.

This application Sept. 8, 1971, Ser. No. 178,831

Int. Cl. B65b 3/04

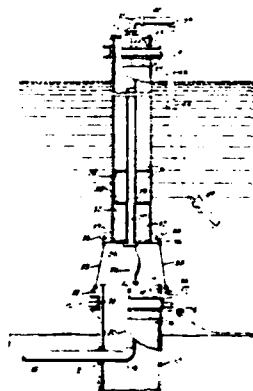
U.S. Cl. 141-388

6 Claims

The invention relates to a ship's mooring of the single point type for an offshore location, including a liquid cargo loading facility. The mooring comprises a foundation member such as a pile or the like which is imbedded in the offshore substratum with a portion projecting thereabove. A buoyant casing extending to the water's surface is operably engaged at its lower end with the foundation member to enclose and protect a liquid carrying conduit. Said conduit is communicated either with a shore based source of liquid to be transferred to a transport vessel, or is coupled with a floating storage vessel such as a tanker or barge. In the latter instance, the storage or transport vessel is positioned by a rotatable connection at the foundation member whereby to limit movement of the vessel during a liquid transfer operation.

Keywords: Offshore mooring structure; Offshore platform anchor

U.S. Cl. X.R. 9-8P; 137-236



JULY 22, 1975

3,895,471

METHOD AND APPARATUS FOR FORMING  
ELONGATED BATTER PILING IN SITU

Alfred Reeves Kolb, Garalston on Sea, England, assignor to  
Brown & Root, Inc., Houston, Tex.

Filed Apr. 9, 1974, Ser. No. 459,340

Int. Cl.<sup>5</sup> E02D 5/28

U.S. Cl. 52-726

17 Claims

Keywords: Offshore construction; Pile place-  
ment; Pile section connection;  
Pile, steel

U.S. Cl. X.R. 52-747; 61-52.5

A method and apparatus is disclosed for forming a batter piling in situ from successive lengths of add-on piling. Initially, one end of a generally vertically suspended add-on piling is positioned in at least partial abutting contact with a similar portion of an upwardly extending free end of a batter piling. Next, the add-on is arranged in a posture of rough, generally axial alignment with the previously placed piling. The positioning and arrangement of the add-on is accomplished, at least in part, by a piling guide member which is connected to the add-on. Next a releasable clamping apparatus stabilizes the position and arrangement of the add-on by exerting a clamping force at the point of abutting contact between the add-on and the previously placed piling. The clamping force is next selectively released to permit the add-on to pivot under the influence of gravity into a position of accurate axial alignment with the previously placed batter piling.



3,895,592

BOAT LIFT

Arthur Shelly King, 8021 Cherokee Ln., Leawood, Kans.  
66206

Continuation-in-part of Ser. No. 326,536, Jan. 24, 1973,  
abandoned. This application Jan. 9, 1974, Ser. No. 431,855

Int. Cl. B63c 1/6

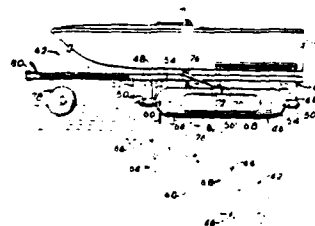
U.S. Cl. 114-45

11 Claims

Keywords: Small-craft launcher; Small-craft  
service structure

U.S. Cl. X.R. 61-65; 214-1A

One embodiment of a boat lift utilizes elongated, upendable floats of polyurethane material which project more deeply into the water when the floats are upright than when they are prone. Attachment of the carriage of the lift to the floats adjacent their "sinking ends" causes the carriage to be submerged when the floats are upright and to be raised for supporting a boat when the floats are in their prone positions. A second embodiment of the lift utilizes hollow pontoons which may be filled with water or air to cause submersion or flotation of the lift and which are rotatable between float positions in which air supplied to the pontoons is trapped therein, and sink positions in which air is allowed to exhaust from the pontoon while water flows therein. Diametrically opposed air pockets on the outside of the pontoons cause automatic return thereof from their sink positions to their float positions, and outlet tubes projecting downwardly from the pontoons when the latter are in their float positions prevent air from escaping from the pontoons during rough water conditions.



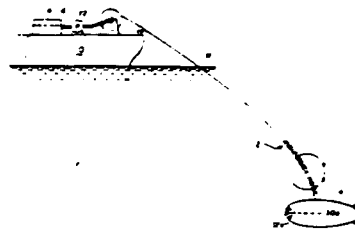
3,895,595  
**FAIRED CABLE DRAG REDUCTION WITH  
 NON-NEWTONIAN FLUIDS**

Raymond E. Kelly, and Richard E. Lovejoy, both of Panama City, Fla., assignors to The United States of America as represented by the Secretary of the Navy, Washington, D.C.  
 Filed Feb. 11, 1974, Ser. No. 441,724  
 Int. Cl.<sup>2</sup> B63B 21156, 1134  
 U.S. Cl. 114—235 F 11 Claims

An underwater towing cable system is described wherein a non-Newtonian fluid is pumped from a towing ship reservoir, through a supply passage extending substantially the length of a faired cable assembly, for distribution through pores into a boundary layer of water adjacent the cable assembly. The pores may be limited to predetermined portions of the cable assembly and may be characterized by effective areas that increase proportional to position along the cable length, whereby fluid distribution is uniform irrespective of frictional losses in the supply passage.

Keywords: Towing cable

U.S. Cl. X.R. 114-67R



3,895,687  
**ACOUSTIC IMPULSE GENERATOR**

Joseph K. McLaughlin, Jr., Rochester, and Dennis R. Courtright, Canandaigua, both of N.Y., assignors to Hydroacoustics, Incorporated, Rochester, N.Y.  
 Filed June 26, 1974, Ser. No. 483,262  
 Int. Cl.<sup>2</sup> G01V 1104

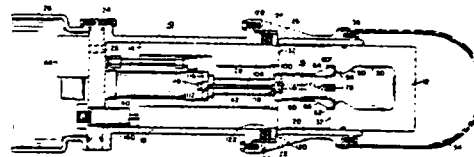
U.S. Cl. 181—120

14 Claims

Apparatus for generating high energy impulses or acoustic transients when submerged under water is described. A piston is moved against the external water pressure head to an outward position by rollers which are pivotally mounted on latch arms and which engage a cam surface at the rear of the piston. When the piston reaches the outward position, the rollers are pivoted by a trip bar which travels with the rollers to the outward position. The rollers then ride over the cam surface, thus releasing the piston to travel over a return stroke to a rearwardly disposed anvil. The energy of the water head is converted to kinetic energy of a moving column of water as the piston is accelerated rearwardly on the return stroke. The moving column of fluid is suddenly decelerated when the piston impacts the anvil; thus, converting the kinetic energy of the moving fluid column into an acoustic impulse or transient in the form of a shock wave which is radiated outwardly into the surrounding water. A shock absorber and dampers are associated with the anvil to bring the piston gently to rest after impact.

Keywords: Seismic implosive acoustic transmitter

U.S. Cl. X.R. 92-29; 187-113



JULY 29, 1975

3,896,566

**SUBMARINE DIGGING WHEEL WHICH DISCHARGES  
MATERIAL IN AN AIR CHAMBER**

Cornelis Van der Gaag, Delft, Netherlands, assignor to N.V.  
Industriele Handelscombinatie Holland, Rotterdam, Netherlands

Filed Feb. 21, 1974, Ser. No. 444,387

Claims priority, application Netherlands, Feb. 21, 1973,  
7302421

Int. Cl. E02f 3/92

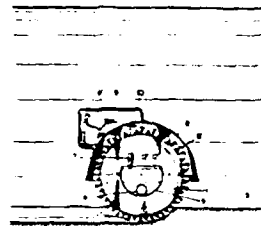
U.S. CL 37-56

3 Claims

A submarine dredge comprises a rotatable bucket wheel surmounted by a hood. Compressed air is fed beneath the hood so that the water level beneath the hood is maintained a substantial distance below the high point of the path of the buckets. As a result, the buckets discharge into air much more readily than they would discharge if totally submerged. The solids discharged from the bucket are caught in a hopper within the wheel, and means are provided to supply water to the hopper so that a water-soil mixture can be removed by suction. Water jets are played into the buckets to assist discharge therefrom and the jets are controlled visually either remotely or directly.

Keywords: Dredge, cutterhead; Dredge intake

U.S. Cl. X.R. 37-70



3,896,567

**DREDGING BUCKET HAVING A REINFORCED EDGE**

Bernad Kos Leoben, and Alois Kubasa, Mitterdorf, both of  
Austria, assignors to Gebr. Boehler & Co. AG, Vienna,  
Austria

Filed Nov. 8, 1973, Ser. No. 414,092

Claims priority, application Austria, Nov. 24, 1972,  
10006/72

Int. Cl. E02f 9/28, B23p 3/00

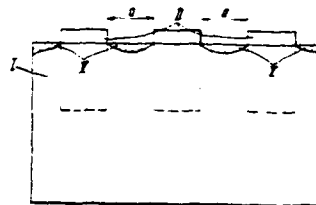
U.S. CL 37-141 R

2 Claims

A reinforced dredging bucket of hardened manganese steel has an edge formed from a plurality of successively alternating, integrally cast first and second regions. The first regions consist of the main bucket metal formed from a composition consisting of 0.5 to 2 % carbon; 6 to 30 % manganese; and up to 3 % silicon, chromium, molybdenum, and vanadium, singly or in combination, the rest being iron and steel impurities. The second regions, which may project beyond the first regions to form teeth, consist of a wear-resistant material formed from 1.2 to 4 % carbon; 15 to 30 % chromium; 0.2 to 10 % manganese; 0.1 to 5 % silicon; up to 10 % nickel; and up to 10 % of elements forming carbides and/or nitrides, the rest being iron and steel impurities.

Keywords: Dredge, mechanical

U.S. Cl. X.R. 29-191; 29-196.1; 29-196.6



3,896,622  
**MOBILE POWER GENERATION DEVICE EMPLOYING  
 TROPICAL WATER THERMOCLINE**  
 George T. Daniello, 15704 Pamela Dr., Silver Spring, Md.  
 20904

Filed July 22, 1974, Ser. No. 490,845  
 Int. Cl. F03g 7/06, 7/04

U.S. Cl. 60-641 13 Claims

A power generating device operating in tropical ocean waters, containing a working fluid which absorbs heat from the warm surface ocean water to boil and vaporize to raise a piston. The device is then caused to descend to colder water depths whereby the vapor condenses, allowing the piston to fall through its stroke to perform useful work.

Keywords: Electrical generator; Power, submerged source

U.S. Cl. X.R. 60-641



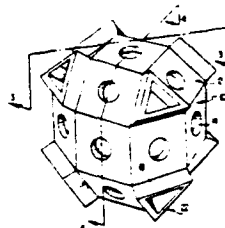
3,896,624  
**POLYHEDRAL, POROUS, AND HOLLOW BLOCK**  
 Daii Chin Chang, Ko Ho, 85 Block, Suhkkyo-dong Mapo-Ku,  
 Seoul, South Korea

Filed May 3, 1974, Ser. No. 466,639  
 Claims priority, application South Korea, May 3, 1973, 719  
 Int. Cl. E02B 3/04

U.S. Cl. 61-4 5 Claims

A polyhedral structural block having a hollow core and perforated surfaces, which is useful in forming underwater structural foundations for revetments, breakwaters, dikes, jettiers, piers, abutments and the like, comprising six apertured, flat rectangular sides and twelve apertured, flanged rectangular sides wherein the adjacent flanges of the latter are arranged so as to form eight open triangular sides.

Keywords: Concrete block; Seabed foundation



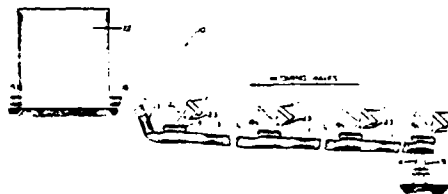
3,896,625  
**POWER CONVERSION APPARATUS FOR UTILIZING  
 THE FORCE OF WAVES**

David K. Lockhart, 805 Watts St., Durham, N.C. 27701  
 Filed July 5, 1974, Ser. No. 485,956  
 Int. Cl. E02B 9/08

U.S. Cl. 61-20 2 Claims

An apparatus for utilizing the force of waves uses the tremendous inertia of falling water together with the constant rhythmic undulation effect of the surf to collect and pressurize water for subsequent release as a source of power. The collecting apparatus consists of a flexible pipe which includes funnels and check valves along its length. The funnels are held by flotation collars so that the faces of the funnel orifices are awash even in calm sea. The seaward end of the pipe is secured but with enough slack to provide movement with the undulation effect of the surf. The discharge end of the pipe empties into a reservoir where the water is pressurized and stored until it is used to drive a turbine, or the like.

Keywords: Power, wave



3,896,628

# MARINE STRUCTURES

Frode Johan Hansen, Kingswood, England, assignor to Redpath Dorman Long (North Sea) Limited, Bedford, England  
Filed Nov. 29, 1973, Ser. No. 420,294

Claims priority, application United Kingdom, Dec. 1, 1972, 55533/72; July 20, 1973, 34679/73; July 20, 1973, 34681/73; July 20, 1973, 34682/73

Int. Cl.<sup>2</sup> E02B 17/00; E02D 23/16

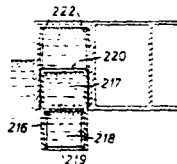
U.S. Cl. 61-46.5

17 Claims

A maritime assembly having its foundation raft and tower structure constructed separately, and then joined by the engagement of spigot and socket portions. By this reduction of pressure between those portions, hydrostatic force can be used to secure the tower structure to the foundation raft. Features include the use of a semi submersible to lower the foundation raft to the seabed, and the use of sand jacks to found the raft thereon.

Keywords: Offshore construction; Offshore platform, fixed; Seabed foundation

U.S. Cl. X.R. 61-50



3,896,753

# HYDROPHILIC POLYMER COATING FOR UNDERWATER STRUCTURES

Thomas H. Shepherd, Hopewell, and Francis E. Gould, Princeton, both of N.J., assignors to National Patent Development Corporation, New York, N.Y.

Continuation-in-part of Ser. No. 838,269, July 1, 1969, Pat. No. 3,575,123, which is a continuation-in-part of Ser. No.

654,044, July 5, 1967, abandoned, which is a continuation-in-part of Ser. No. 650,259, June 30, 1967, abandoned, which is a continuation-in-part of Ser. No.

567,856, July 26, 1966, Pat. No. 3,520,949. This application Jan. 14, 1971, Ser. No. 106,374. The portion of the term of this patent subsequent to Apr. 13, 1988, has been disclaimed.

Int. Cl. B63b 1/34

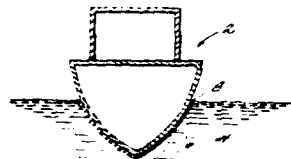
U.S. Cl. 114-67 R

12 Claims

Hydrophilic polymers are applied to the underwater portions of surfaces which move through water or surfaces against which water is flowing in order to reduce drag.

Keywords: Coating; Fouling prevention

U.S. Cl. X.R. 106-15AF; 106-193; 106-194; 106-196; 106-197; 117-94; 117-132C; 117-161UN; 117-161UB; 260-29.68M; 260-29.6H; 260-45.7R; 260-45.75R; 424-80



3,896,756

# DEPTH CONTROL APPARATUS FOR TOWED UNDERWATER CABLES

Raymond H. Pearson; Thomas E. White, both of Richardson, and James R. Perkins, Dallas, all of Tex., assignors to Whitehall Electronics Corporation, Dallas, Tex.

Filed Feb. 2, 1971, Ser. No. 112,002

Int. Cl. B63b 21/56

U.S. Cl. 114-235 B

8 Claims

An apparatus for maintaining at a predetermined depth a tow cable, such as that of a seismic streamer, being towed by a vessel, the apparatus having one or more depth controller devices attached to the cable at spaced intervals therealong and a remote command transmitter on the tow vessel for transmitting commands to the depth controller devices, the depth controller devices having a mechanism responsive to deviations between the commanded depth of the cable and its actual depth for moving diving planes of the controller devices to cause the controller devices to move to the commanded depth as the cable is towed along by the vessel.

Keywords: Seismic streamer cable; Towed body depth control

U.S. Cl. X.R. 340-7PC



215

3,896,898  
HIGH FREQUENCY SEISMIC SOURCE USING  
COMPRESSED AIR

Robert Andrew Kirby, and Joseph Frank Bashir, both of Houston, Tex., assignors to Exxon Production Research Company, Houston, Tex.

Filed June 6, 1973, Ser. No. 367,672

Int. Cl. G01v 1/22

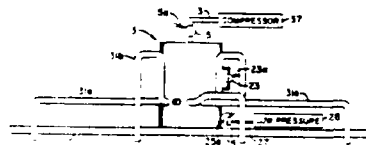
U.S. Cl. 181-120

3 Claims

The invention is a seismic source using compressed gas such as air as the source of energy. The compressed gas is stored in a reservoir and is quickly released into a multiplicity of elongated conduits extending from the reservoir to beneath the surface of a liquid medium such as the ocean. The exhausts or open ends of the tubes are arranged in an areal pattern. The diameter of the tubes preferably is between 0.5 and 5.0 centimeters and the length of the tubes or conduits is between 0.5 and 5.0 meters. Preferably, the tubes are of the same length so that the compressed air is released into the liquid medium concomitantly from all of the conduits.

Keywords: Seismic acoustic transmitter array; Seismic explosive acoustic transmitter

U.S. Cl. X.R. 181-115; 340-7R



AUGUST 5, 1975

3,897,639  
VEHICLE FOR UNDERWATER EXCAVATION BENEATH  
A STRUCTURE

Frode Johan Hansen, Kingswood, England, assignor to Redpath Dorman Long (North Sea) Limited, Bedford, England Division of Ser. No. 223,590, Feb. 4, 1972, Pat. No. 3,783,626. This application June 25, 1973, Ser. No. 373,241

Claims priority, application United Kingdom, Feb. 8, 1971, 4191/71

Int. Cl.<sup>2</sup> E02F 3/88, E02D 25/00

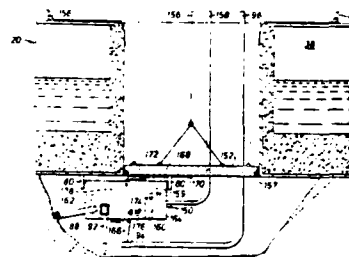
U.S. Cl. 37-56

5 Claims

A vehicle for excavating under a structure being founded on a subaqueous bed, the vehicle comprising a buoyancy chamber and structure for admitting and expelling water from the chamber to control the buoyancy of the vehicle, powered wheels or rollers to enable the vehicle to contact and move about in any direction on an undersurface of the structure and to rotate about its own center.

Keywords: Dredge, suction; Dredge propulsion; Dredge, submerged; Offshore construction; Seabed foundation

U.S. Cl. X.R. 37-63; 37-64; 37-72; 114-55





3,897,741

**FLOATING DOCK STRUCTURE, AND THE RELATIVE  
SERVICE GANGWAY**

Alfredo Martini, Monza, Italy, assignor to Patentwerke An-  
stalt, Vaduz, Liechtenstein

Filed Jan. 14, 1974, Ser. No. 433,427

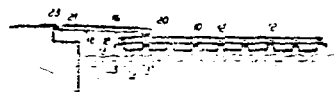
Claims priority, application Italy, Mar. 12, 1973, 21477/73  
Int. Cl. B63b 35/38

U.S. Cl. 114—0.5 F

6 Claims

Floating dock structure comprising two pairs of chan-  
nel sections rigidly connected to define a rectangular  
support frame. A plurality of floating containers are  
arranged below the rectangular frame for enabling the  
dock to float and are constrained in place by cross  
angle sections. The containers support at least a sheet  
of marine plywood above which a plurality of foot-  
boards are provided. The dock structure has a relative  
service gangway of rectangular structure. The frame  
of the gangway comprises two pairs of angle sections  
above which there are located a sheet of marine ply-  
wood, this latter supporting a plurality of footboards.  
The gangway rests at its one end on the dock and is  
provided at the other end with means for coupling to  
the dry land.

Keywords: Pier, floating



3,897,835

**PILE DRIVER DRIVE CAP**

Leonard L. Frederick, 15 Crestview Ter., Whippany, N.J.  
07981

Division of Ser. No. 142,174, May 11, 1971, Pat. No.

3,817,091. This application Feb. 21, 1974, Ser. No. 444,688

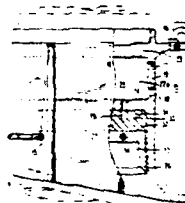
Int. Cl.<sup>2</sup> E02D 7/14

U.S. Cl. 173—131

9 Claims

A water-cooled drive cap for use with pile driving ma-  
chines which also includes a sensing construction ac-  
tuatable either electrically or pneumatically to provide  
an indication of the condition of the pile head and  
thereby prevent overdriving thereof.

Keywords: Pile driver, impact; Pile load  
measurement



3,898,471

**ELECTRIC GENERATOR RESPONSIVE TO WAVES IN BODIES OF WATER**

Enos L. Schera, Jr., 8254 S.W. 37th St., Miami, Fla. 33155  
Filed Aug. 15, 1974, Ser. No. 497,653  
Int. Cl.<sup>7</sup> F03B 13/12

U.S. Cl. 290—42

9 Claims

A float operated electric generator responsive to surface waves in a body of water independent of predetermined variations in the level of the water.

Keywords: Electrical generator; Power, wave

U.S. Cl. X.R. 290-53



3,898,609

**UNDERWATER EXPLORATION DEVICE**

Christian Charles, Brest, France, assignor to Centre National pour l'Exploitation des Océans (CNEXO) and Le Nickel, both of Paris, France, part interest to each  
Filed Nov. 21, 1973, Ser. No. 417,939  
Claims priority, application France, Nov. 21, 1972, 72.41224

Int. Cl. G08b 5/40

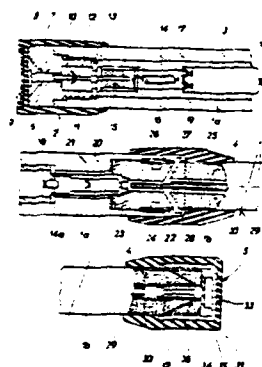
U.S. Cl. 340—4 R

11 Claims

There is disclosed a smoke generator for use on underwater exploration devices. Upon descent of the exploration device, the smoke generator is automatically armed when hydrostatic pressure increases to a predetermined level. Upon ascent, the smoke generator is automatically triggered when hydrostatic pressure decreases to a predetermined level.

Keywords: Instrument retrieval

U.S. Cl. X.R. 9-8R; 102-90



AUGUST 12, 1975

3,898,846

OFFSHORE STORAGE TANK

John Stanton McCabe, Naperville, Ill., assignor to Chicago Bridge & Iron Company, Oak Brook, Ill.

Filed Feb. 19, 1974, Ser. No. 443,341

Int. Cl.<sup>2</sup> E02B 29/06, F17C 1/00

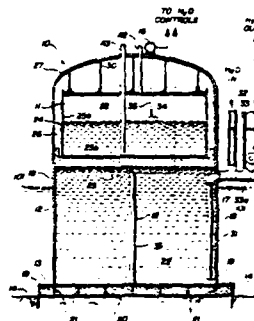
U.S. Cl. 61—46

13 Claims

A multi-section tank for offshore liquid storage having an insulated upper receptacle for storage of a liquid at a temperature above or below atmospheric temperature and a lower receptacle filled with fluid, advisably a liquid such as water, oil or the like or a combination of a liquid and a gas. The fluid provided within the lower receptacle functions as a support for the bottom of the upper receptacle thereby eliminating the need for structural supports for the bottom of the upper receptacle when it contains a liquid load. The fluid in the lower receptacle also exerts an internal pressure which counteracts the external compressive sea forces. The lower receptacle is generally kept full enough with a liquid so that the weight of the liquid plus the tank weight enables the tank to withstand horizontal and overturning forces of the sea when the tank rests on a sea floor and the upper receptacle is empty. The upper receptacle is particularly suitable for storing a liquefied gas.

Keywords: Offshore storage tank, emergent

U.S. Cl. X.R. 114-74A; 220-91G; 220-13



3,898,847

FIXED PLATFORM FOR DEEP SEA DEPTHS ABLE TO HOUSE PLANTS, EQUIPMENTS STRUCTURES, MEN AND MEANS

Umberto Magnanini, San Donato Milanese, Italy, assignor to Tecnomare S.p.A., San Donato Milanese, Italy

Continuation of Ser. No. 270,733, July 11, 1972, abandoned.

This application May 22, 1974, Ser. No. 472,234

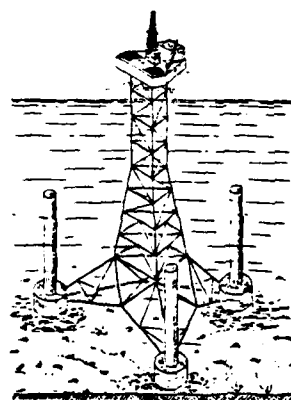
Int. Cl.<sup>2</sup> E02B 17/00

U.S. Cl. 61—46.5

3 Claims

A platform is described which is adapted to house an industrial plant, apparatus for drilling off-shore wells in a deep sea and personnel for operating such plants and apparatus, and which is constituted by a triangular bridge assembly and vertical support means including a triangular upper section projecting above the surface of the water, a triangular base whose diameter is greater than the diameter of the upper section and a triangular intermediate section connecting the upper section with the base so that the bridge assembly is held in fixed position above the surface of the sea. The base is formed from three opposed reticular pyramidal members whose apices bear, respectively, upon supports having a conical form with an upwardly extending vertex and provided with a hollow caisson bearing a hollow, vertical stabilization column extending upwardly therefrom which are adapted to receive a fluid controlling the buoyancy of the platform so that it may be caused to float or rest upon the sea bed in vertical position.

Keywords: Offshore caisson; Offshore platform, fixed; Seabed foundation; Seabed scour protection



3,898,852

# DITCHING MACHINES FOR SUBMARINE CABLE

Takuji Ezne, and Kikuo Shirai, both of Tokyo, Japan, assignors to Kokusai Cable Ship Co., Ltd., Tokyo, Japan

Filed June 7, 1973, Ser. No. 367,389

Claims priority, application Japan, June 7, 1972, 47-056103

Int. Cl.<sup>2</sup> E02F 5/02; F16L 1/00

U.S. Cl. 61-72.4

4 Claims

A ditching machine for digging a ditch for submarine cable comprising a main body having stabilizing means which is divided into front and rear parts and jointed so as to be bendable only up and down, and a cutting bit mounted rigidly under said rear part of the main body, to prevent the entering of the head of said stabilizing means into earth and sand on the sea-bottom and to provide stable cable burying without regard to whether the layer at sea-bottom is hard or soft.

Keywords: Seabed cable plow

U.S. Cl. X.R. 61-72.6



3,899,032

# METHOD AND APPARATUS FOR DEVIATING CONDUCTOR CASING

Thomas E. Rees, Tulsa, Okla., and Frank D. Priebe, Houston, Tex., assignors to Cities Service Oil Company, Tulsa, Okla.

Filed Mar. 15, 1974, Ser. No. 451,614

Int. Cl.<sup>2</sup> E21B 15/02

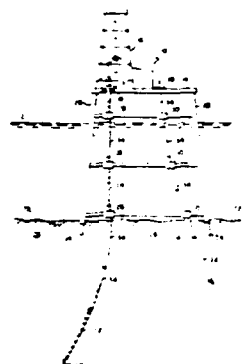
U.S. Cl. 175-9

24 Claims

A method and apparatus for deviating conductor casing, or the like, as it is being driven into a substratum. The conductor casing has an enclosed beveled end, or a partial enclosed beveled end providing an opening for the emission high pressure fluid fed from the surface.

Keywords: Offshore platform, fixed

U.S. Cl. X.R. 175-61; 175-73; 175-422



3,899,213

# AIRBORNE LASER REMOTE SENSING SYSTEM FOR THE DETECTION AND IDENTIFICATION OF OIL SPILLS

John F. Fantasia, Newton, and Hector C. Ingrao, Wellesley, both of Mass., assignors to The United States of America as represented by the Secretary of the Department of Transportation, Washington, D.C.

Filed Mar. 8, 1974, Ser. No. 449,327

Int. Cl.<sup>2</sup> G01T 1/169; G01N 21/38

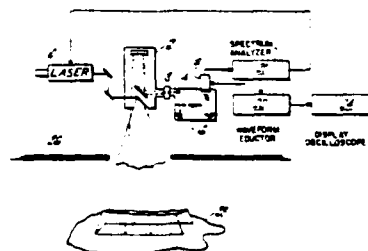
U.S. Cl. 250-301

8 Claims

A technique for the identification, from a remote location, of oil comprising a marine oil spill. The technique includes directing pulses of high energy artificial light onto the spill to cause the oil to fluoresce and the incremental scanning of the frequency spectrum of the thus generated fluorescence energy; there being a distinct fluorescent spectral signature for each type of oil. The invention also includes the rejection of background radiation and the real time presentation of the fluorescence spectrum of the oil comprising a spill.

Keywords: Instrument, airborne; Instrument, laser; Pollutant measurement

U.S. Cl. X.R. 250-461



AUGUST 19, 1975

3,899,891

POST-TENSIONED PRESTRESSED PILE ASSEMBLY

William F. Kelly, 100 Bellaire Dr., and Robert B. Anderson,  
5920 Memphis St., both of New Orleans, La. 70124

Filed Jan. 22, 1974, Ser. No. 435,446

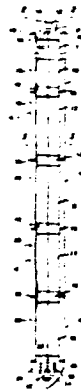
Int. Cl.<sup>2</sup> E02D 5/30, 5/38

U.S. Cl. 61-56

14 Claims

A post-tensioned prestressed pile assembly which includes a plurality of vertically arranged, tubular driving shell sections joined in end-to-end relationship. A combination pile driving point and anchoring plug is connected to the lowermost shell section. A tendon anchored to the combination driving point and plug extends through the longitudinal axis of the shell sections and is held in axial alignment by members located at intervals through the pile assembly. The tendon passes through a live end anchor in a driving head to permit jacking thereof for tensioning the tendon and placing the pile assembly in compression.

Keywords: Pile, concrete; Pile-driving shoe;  
Pile section connection



3,899,991

WEATHER RESISTANT SEGMENTED FAIRING FOR A  
TOW CABLE

Clarence K. Chatten, Mesa, Ariz.; Saul A. Eler, Whitestone,  
N.Y.; Reece Folb, Laytonville, and Arthur P. Brisbane,  
Gaithersburg, both of Md., assignors to The United States of  
America as represented by the Secretary of the Navy, Wash-  
ington, D.C.

Filed Dec. 17, 1973, Ser. No. 425,434

Int. Cl.<sup>2</sup> B63B 21/10

U.S. Cl. 114-235 F

2 Claims

A weather- and ozone-resistant elastomeric fairing for a tow cable comprising a plurality of sections using butyl synthetic rubber (Butyl-035) as the base polymer. Each section of the fairing is independently suspended and attached to the tow cable by fairing support rings and yokes by means of clips. The material for the fairing sections is fabricated with Butyl-035 as a base polymer and using different amounts of Elastopar, SAF black, zinc oxide, stearic acid, dioctyl sebacate, sulfur, methyl tuads, and captax to give the fairing sections weather resistant properties.

Keywords: Towing cable

U.S. Cl. X.R. 114-235F



3,900,543

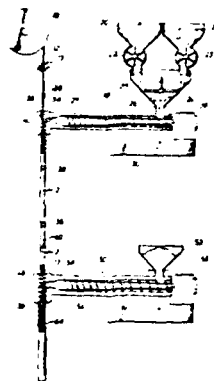
**METHOD FOR MAKING A FOAM SEISMIC STREAMER**  
 Billy W. Davis, Flagstaff, Ariz., assignor to Schlumberger  
 Technology Corporation, New York, N.Y.

Division of Ser. No. 105,547, Jan. 11, 1971, Pat. No.  
 3,744,016. This application Oct. 26, 1972, Ser. No. 301,047  
 Int. Cl. G01v 1/02, H04b 13/02  
 U.S. Cl. 264-45.3 5 Claims

A neutrally buoyant seismic hydrophone streamer is constructed by extruding a syntactic foam material comprising an elastomeric material and gas filled microspheres onto a central stress member to form an elongated streamer member. The streamer may then be covered with a suitable water and oil resistant, abrasion resistant covering and be provided with exteriorly affixed hydrophones, or hydrophones can be affixed to the foam core and an outer protective sheath can be extruded or otherwise provided around the streamer and the hydrophones to provide a uniform diameter streamer assembly. Extrusion is effected utilizing a suitable elastoplastic material which can be extruded at pressures below about 300 psi to avoid bursting the gas filled spheres of the syntactic foam.

**Keywords:** Seismic streamer cable

U.S. Cl. X.R. 161-DIG.5; 174-101.5; 264-DIG.6;  
 340-7R; 264-45.9; 264-46.7



AUGUST 26, 1975

3,901,040

**COLLISION BUMPER FOR OFFSHORE STRUCTURES**  
 William A. Sandberg, 325 S. Orange Grove, Pasadena, Calif.  
 91105

Filed Oct. 7, 1974, Ser. No. 512,440  
 Int. Cl. E02B 3/20

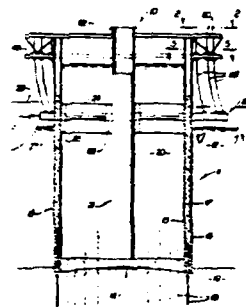
U.S. Cl. 61-46

13 Claims

An offshore installation includes means to absorb or resist vessel collision forces. It includes a heavy bumper suspended by upright beam flexures which are in turn supported at their upper ends above the bumper; in addition, lateral supports locally resist lateral displacement of the flexure beams below the upper supports and above the bumper, so that the flexures may desirably bend throughout their lengths. The connections of the beam flexures to the upper supports and to the bumper may be such as to allow rotation of the flexures about upright axes in response to initial side-ward displacement of the bumper, and into flexure positions accommodating their bending as described so that protection from vessel collision in any azimuth direction is afforded.

**Keywords:** Collision protection; Offshore storage tank, emergent; Offshore structure fender

U.S. Cl. X.R. 114-219



3,901,042

**REINFORCED CONCRETE PILE AND A METHOD OF MANUFACTURING SUCH A PILE**

Lorentz Wahman, Goteborg, Sweden, assignor to Roy Asserback, Marbella, Spain

Filed May 21, 1974, Ser. No. 471,899

Claims priority, application Sweden, May 21, 1973, 7370922

Int. Cl. E02d 5/30, 5/34, 5/52

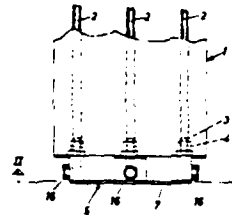
U.S. Cl. 61-56

6 Claims

In a concrete pile the axially running bars of the reinforcing structure are attached to an end collar of the pile by threaded connectors screwed into the collar and each enclosing the threaded end of a reinforcing bar.

Keywords: Pile, concrete; Pile section connection

U.S. Cl. X.R. 52-127; 52-722; 52-726



3,901,075

**ACOUSTIC VELOCIMETER FOR OCEAN BOTTOM CORING APPARATUS**

Lloyd D. Hampton, Austin, and Donald J. Shirley, Leander, both of Tex., assignors to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Jan. 10, 1974, Ser. No. 432,384

Int. Cl. E21B 49/02

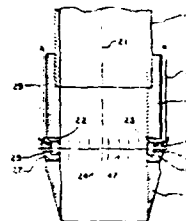
U.S. Cl. 73-170 A

10 Claims

The invention disclosed herein deals with in situ measurement of the acoustical properties of the ocean floor while ocean sediment core samples are being obtained and specifically provides means for generating a sound wave. A record is made of the sound transmission characteristics of the core sample as a true representation of the ocean floor in its natural state in that location.

Keywords: Instrument, seabed in situ; Sampler, seabed-driven core; Seabed property measurement

U.S. Cl. X.R. 73-153; 175-5; 175-20; 175-46; 175-50



SEPTEMBER 2, 1975

3,902,448

**DREDGE HAVING IMPROVED PROPELLING MEANS**

Carl E. Davis, Rt. 3, Box 371-D, Edwardsburg, Mich. 49112

Filed Oct. 25, 1973, Ser. No. 409,759

Int. Cl. B63b 21/56

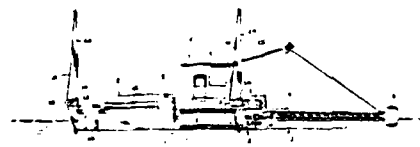
U.S. Cl. 115-9

2 Claims

A dredge in which the barge thereof carries a pair of forwardly located spuds each positioned on opposite sides of the dredge and a rearwardly located spud, which is carried by an extendible portion of the barge at its aft end. The pair of spuds at the fore end portion of the barge are shiftable longitudinally of the barge along its sides. With all three spuds embedded in the underlying water bottom, the barge through cylinder means is pushed ahead relative to the rear spud between the forward two pairs of spuds as the dredging operation progresses.

Keywords: Dredge, cutterhead; Dredge propulsion

U.S. Cl. X.R. 37-73



SEPTEMBER 9, 1975

3,903,701

FLOATING BOOM

George J. Gauch, Greenville, R.I., assignor to Uniroyal, Inc.,  
New York, N.Y.

Filed Apr. 22, 1971, Ser. No. 136,377

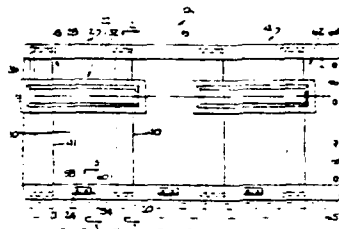
Int. Cl.<sup>2</sup> E02B 15/04

U.S. Cl. 61-1 F

11 Claims

A floating boom in which a flexible sheet forms a barrier on the surface of a liquid for confining materials, e.g., pollutants floating thereon. A plurality of floats support the sheet such that portions of the latter extend above and beneath the surface of the liquid. Stiffeners reinforce the sheet and cooperate therewith in resisting external forces applied thereto.

Keywords: Pollutant, surface barrier



3,903,702

REVTMENT STRUCTURE

Samuel Alan Appleton, Taunton, England, assignor to Dytip  
Construction Holdings Ltd., England

Filed May 8, 1973, Ser. No. 358,310

Claims priority, application United Kingdom, May 9, 1972,  
21600/72

Int. Cl. E02b 3/12

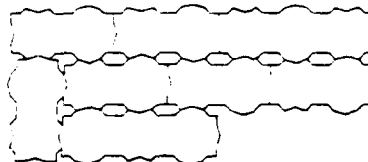
U.S. Cl. 61-37

3 Claims

The invention provides a system of interfitting concrete units for surfacing revetments or other ground liable to erosion. Each unit is provided with cavities to retain earth on the finished surface and has a special outline shape such that opposite longitudinal sides are reflections of each other. This is claimed to avoid any tendency for the units to rotate when subjected to stresses in the finished structure. The units may optionally be provided with sockets into which dowels may be fitted to further prevent dislodgement of any one unit.

Keywords: Concrete block; Low-cost shore  
protection; Revetment; Slope  
protection

U.S. Cl. X.R. 52-608; 404-41





3,903,705

APPARATUS FOR ANCHORING MARINE STRUCTURES

Robert W. Beck, and Lyle D. Finn, both of Houston, Tex.,  
assignors to Exxon Production Research Company, Houston,  
Tex.

Filed Jan. 24, 1974, Ser. No. 436,253

Int. Cl.<sup>2</sup> E02D 21/00; B63B 21/00, 21/24

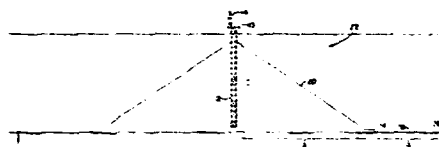
U.S. Cl. 61—46

8 Claims

A marine structure, e.g., a drilling and production platform and apparatus for guying such marine structure in a body of water so as to withstand extreme environmental forces, the marine structure being anchored by means of a plurality of anchored guy wires, each guy wire having associated therewith a clump weight adapted to be at least partially supported above the floor of a body of water under normal operating conditions but lift off the sea floor under extreme environmental forces, thereby allowing the marine structure to withstand conditions which, absent the clump weight, would cause failure of the marine structure and guying apparatus. The clump weight is positioned along the guy wire a sufficient distance from an anchor to maintain the forces on the anchor substantially horizontal even when the clump weight is lifted off the sea floor by extreme environmental forces. A longitudinally articulated clump weight is preferred for guyed marine structures. Such a clump weight can comprise a plurality of chain segments arranged in parallel or other suitable longitudinally articulated weight segments.

Keywords: Offshore platform anchor

U.S. Cl. X.R. 114-206



3,904,528

PICK-UP ELEMENT FOR OILY CONTAMINANTS

Charles H. Yocum, 463 Adamsville Rd., Westport, Mass.  
02790

Filed June 29, 1973, Ser. No. 374,886

Int. Cl. C02h 9/02

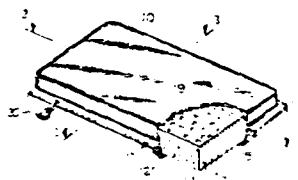
U.S. Cl. 210—242

8 Claims

An element for picking up oily contaminant in liquid form from the surface of a body of water. The element has an outer container of porous material which is pervious to oily contaminants in liquid form and impervious to water. An absorber is positioned in said container and substantially fills it. The absorber is a spongy material which will absorb oily contaminant and has large spaced parallel surfaces and a plurality of slits therethrough in the direction of the thickness of the absorber. The slits define a plurality of wide flat strips which lie against each other. The slits extend from one end of the absorber to just short of the other end. Granules of absorbent material are sprinkled over the surfaces of the absorber.

Keywords: Pollutant absorption

U.S. Cl. X.R. 210-40; 210-DIG.21



(225)

SEPTEMBER 16, 1975

3,905,137  
UNDERWATER TRACTOR AND IMPLEMENT  
THEREFOR

James E. Gee, Washington, Ill., assignor to Caterpillar Tractor  
Company, Peoria, Ill.

Filed Feb. 21, 1974, Ser. No. 444,317  
Int. Cl.<sup>2</sup> E02F 3/88

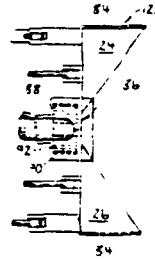
U.S. Cl. 37-56

4 Claims

A tractor includes an internal combustion engine and is adapted for underwater operation, with inlet and outlet means extending to above the surface of the water for supplying air to the engine and exhausting combustion gas therefrom. A dredging implement in the form of a blade and auger, directs material from the floor to adjacent one end of a conduit means as the vehicle is transported over the floor. An impeller associated with the conduit means transports the material therethrough and from the other end of the conduit means, which is positioned above the surface of the water. The dredging implement may alternatively take the form of a pair of wing members, each angled upwardly and inwardly in the rearward direction to direct material to adjacent the one end of the conduit means. Means remote from the vehicle, and positionable on shore, are included for operating the submerged tractor.

Keywords: Dredge, suction; Dredge intake; Dredge, submerged

U.S. Cl. X.R. 37-66; 37-71; 61-69R; 180-1R



3,905,199  
FOOTED DOLPHINS

Myle J. Holley, Jr., 1364 Massachusetts Ave., Lexington, Mass.  
02173

Filed Jan. 7, 1974, Ser. No. 431,456  
Int. Cl.<sup>2</sup> E02B 3/22

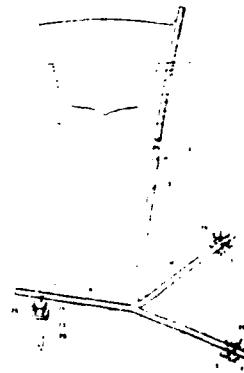
U.S. Cl. 61-46

14 Claims

A dolphin structure is provided in which the overturning moment about the seabed, due to horizontal loading at the upper end, is counteracted by the moment of the dolphin self-weight about its points of support. The dolphin is comprised of a vertical stem supported on the bottom by laterally extending elongate toes which in effect act as a foot upon which the dolphin is balanced. These extensions are similar in structure to the dolphin stem and may be two or more in number. The extensions are rigidly connected to the stem, typically by welding, but alternatively by bolting or other means. The extensions are deployed at various azimuthal angles depending upon the range of directions of horizontal forces anticipated to be applied at the upper end of the dolphin. Embedment in the seabed thus is obviated. The relationship between applied load and horizontal deflection of the loading point is bi-linear and the dolphin is able to absorb far more energy than is associated with the elastic distortion of its component parts.

Keywords: Pile dolphin

U.S. Cl. X.R. 114-219



3,905,322

# BOAT MOORING CLEAT

Donald J. Peterman, 1800 Columbus Blvd., Coral Gables, Fla. 33134, and Ramon Figueroa, 333 Miamarina, Sup 314, Miami, Fla.

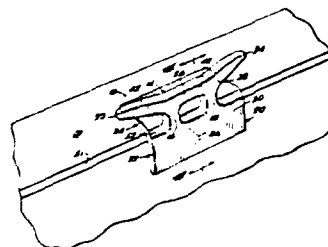
Filed May 6, 1974, Ser. No. 467,284  
Int. CL<sup>7</sup> B63B 21/04

U.S. CL 114—218

6 Claims

A boat mooring cleat, for attachment to a cement structure such as a sea wall, having a horn portion connected to a base portion by a pair of spaced apart legs, the base portion being comprised of a pair of generally right angularly disposed plates, the first of which is adapted to overlie an upper portion of the outer face of a sea wall, the second plate being adapted to overlie an outer portion of the top surface thereof. Pins are provided on the first plate for attachment through the outer face of the sea wall and holes are provided in the second plate to receive attachment means, extending through the sea wall top surface. The outer faces of the horn and first plate are generally coplanar.

Keywords: Small-craft mooring device



3,905,902

# RECOVERY OF OIL AND OIL-SOLUBLE CONTAMINANTS FROM THE SURFACE OF WATER

Ruth G. Hoegberg, 209 Matroy Ln., Wallingford, Pa. 19086, and Walter S. Tyler, Valley View, R.D. No. 1, Landisburg, Pa. 17040

Continuation-in-part of Ser. No. 180,729, Sept. 15, 1971, abandoned. This application Sept. 10, 1973, Ser. No. 395,683  
Int. CL<sup>7</sup> B01D 15/00

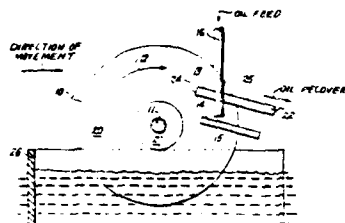
U.S. CL 210—30

10 Claims

Water pickup is minimized in the recovery of oil from water, including sea water, by negatively electrostatically charging hydrophobic rotating discs which are immersed in the water. Oil can be applied to the discs to help maintain the charge in the oil phase. The application of oil to the discs can also be used to remove thin films of oily material which contain oil-soluble contaminants from the surface of a body of water.

Keywords: Pollutant, mechanical removal

U.S. CL. X.R. 210-40; 210-242; 210-DIG.21



3,906,352

**METHOD OF MAKING A THREE-DIMENSIONAL  
SEISMIC PROFILE OF OCEAN FLOOR**

William H. Parker, Hurst, Tex., assignor to Del Norte Technology, Inc., Fulshear, Tex.

Filed Mar. 16, 1973, Ser. No. 342,206

Int. Cl. G01V 1/20, 1/38

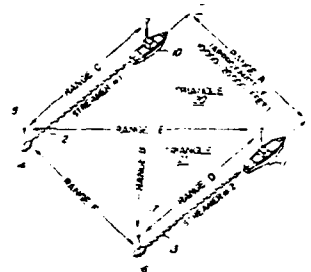
U.S. Cl. 340-7 R

11 Claims

Two survey vessels sail on side-by-side parallel courses. Each vessel tows a streamer-like seismic sound detector array having an attached floating tail buoy, equipped with a microwave transponder. The two vessels are in intimate radio contact with each other, to assist in and coordinate the seismic mapping operations. Alternately, each vessel "shoots" to transmit seismic energy toward the ocean floor. Both vessels record all seismic "shots". Important timing of the reflected sound waves are recorded. Telemetered information is exchanged between the two vessels via VHF in order to tie the two records together. A computer extrapolates and interprets the recorded sound waves to provide three or more profiles of the sub-bottom strata below the ocean floor. The spirit of this invention is to provide at least one beam-steering array suitable for mapping geologic horizons well below the sea floor. The frequencies 10-40 Hz are desirable to penetrate any substantial distance into the earth's crust.

**Keywords:** Seismic survey method

U.S. Cl. X.R. 340-15.5TS; 340-15.5MC



3,906,353

**OSCILLATOR CIRCUIT FOR PROVIDING A  
CONDUCTIVITY RATIO OF SEA WATER**

Lawrence C. Murdock, Bellevue, Wash., assignor to Westinghouse Electric Corporation, Pittsburgh, Pa.

Filed Oct. 9, 1973, Ser. No. 404,563

Int. Cl. G01n 27/42

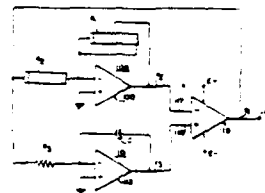
U.S. Cl. 324-30 R

2 Claims

An oscillator circuit wherein two conductivity cells are arranged in a circuit to provide a conductivity ratio which is converted into a linear variation of the period or frequency of the oscillator.

**Keywords:** Salinity measurement

U.S. Cl. X.R. 331-65



3,906,354

**STANDARD CONDUCTIVITY CELL FOR  
MEASUREMENT OF SEA WATER SALINITY AND  
TEMPERATURE**

Lawrence C. Murdock, Bellevue, Wash., assignor to Westinghouse Electric Corporation, Pittsburgh, Pa.

Filed Oct. 9, 1973, Ser. No. 404,564

Int. Cl. G01n 27/42

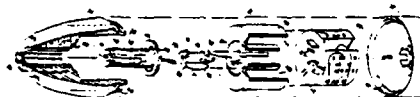
U.S. Cl. 324-30 B

14 Claims

A standard conductivity cell having concentric thin-walled alumina cylinders with a thin film or layer of standard seawater contained between them. Electrical contact is made to the standard seawater by end electrodes and a pressure compensation arrangement allows for the cell's use at great depths in the water. With a known relationship between conductivity and temperature, the cell also operates as a very rapid temperature sensor.

**Keywords:** Bathythermograph; Salinity measurement

U.S. Cl. X.R. 73-362AR; 204-195F



SEPTEMBER 23, 1975

3,906,564

REMOTELY CONTROLLED UNDERWATER  
INSTRUMENT SYSTEM

Clifford T. Thompson, Tracyton, and Dennis J. Schwab, Bremerton, both of Wash., assignors to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Dec. 15, 1972, Ser. No. 315,390  
Int. Cl.<sup>2</sup> B63B 21/52

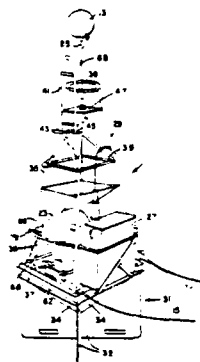
U.S. Cl. 9—8 R

3 Claims

An instrument system that is mounted on the ocean floor that may be used for generating and receiving sound signals. The system includes a buoyant instrument package that is raised and lowered by a support cable driven by winch and power drive assemblies that are controlled and powered from a remote shore station. The system includes a tower that is attached to a base member upon which the winch and power drive assemblies are mounted. The base member includes a plurality of downwardly extending blades and angularly positioned plates that securely support the system when resting on the ocean floor. When retracted, the buoyant instrument package floats a few feet above the tower. The cable used for restraining the buoyant instrument package includes a sensing element to prevent excessive retraction of the instrument package by interrupting power supplied to the power drive assembly. The system includes two electrical cables; one supplies power and the other transmits signals between the shore station and the bottom-mounted winch and instrument package.

Keywords: Buoy mooring system; Instrument deployment

U.S. Cl. X.R. 61-46.5; 114-16.7; 114-206R



3,906,565

DRIFTING OCEAN BUOY

William T. Dorrance, El Cajon, and Norman W. Schofield, San Diego, both of Calif., assignors to General Dynamics Corporation, St. Louis, Mo.

Filed Mar. 28, 1974, Ser. No. 455,778  
Int. Cl.<sup>2</sup> B63B 35/00

U.S. Cl. 9—8 R

17 Claims

A drifting ocean buoy is described which utilizes a drag structure which follows the water mass of the ocean as it flows in the form of the ocean current, and which also has an aerodynamically shaped low wind drag mast to minimize wind induced errors in ocean current drift measurements; the drag structure also being stable and resistant to heaving (pitch and roll) so as to maintain a mast antenna above the water even at high sea states.

Keywords: Buoy, instrumented; Current measurement

U.S. Cl. X.R. 9-8R



3,906,732

SHIPSIDE OIL BARRIER SEAL

Edward T. Tedeschi, Jr., Cohasset, Mass., assignor to The B. F. Goodrich Company, Akron, Ohio

Filed Jan. 10, 1975, Ser. No. 540,908

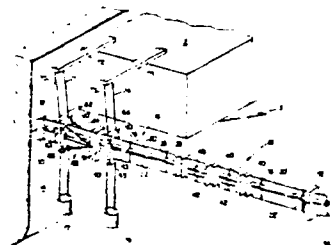
Int. Cl.<sup>2</sup> E02B 15/04

U.S. Cl. 61-1 F

14 Claims

A pier mounted shipside oil barrier seal structure floating on the water surface for use between a generally fixed connection point floating on the water surface and a ship having a side surface. The structure comprises a floating shipside oil seal member vertically extended above and below the water level, having at its ship-contacting end a flexible elastic rubber-like vertically extended sealing element for contacting the ship side surface. It is mounted on the pier by a pair of transversely spaced supports slideably supporting it for transverse movement, the supports being arranged for free vertical movement of the floating oil seal member with the water level as it changes with respect to the pier and the ship side. Springs are connected between the oil seal member and the supports for urging the oil seal element into contact with the ship's side. It may also have a bendably collapsible portion collapsible upon horizontal movement of the ship side toward the fixed connection point.

Keywords: Pollutant, surface barrier



3,906,734

FIXED MARINE PLATFORM WITH DISPERSED BASE

Ivo C. Pogonowski, Blacksburg, Va., and Paul D. Carmichael, Houston, Tex., assignors to Texaco Inc., New York, N.Y.

Filed Aug. 23, 1973, Ser. No. 390,805

Int. Cl.<sup>2</sup> E02D 3/12, 27/02

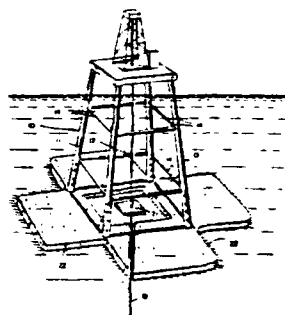
U.S. Cl. 61-46

6 Claims

A fixedly positioned marine platform held at the ocean floor by piles and the like, having a relatively flat concrete apron disposed about the platform lower end and also supported on the ocean floor. The apron functions to stabilize the platform against lateral forces caused by water and wave motion, and also avoids scouring which would otherwise occur about the platform legs and piles due to movement of water along the ocean floor. The apron further lowers the center of gravity of the structure and improves its resistance to vibrations and resonance effects due to wave motion.

Keywords: Concrete form; Fabric mat; Offshore platform, fixed; Seabed foundation; Seabed scour protection

U.S. Cl. X.R. 61-50



3,906,735

# FOUNDATION METHOD FOR CAISSONS

Olas Mo, Groensundveien 94, 1370-Asker, Norway  
Division of Ser. No. 352,679, April 19, 1973, abandoned. This application Feb. 27, 1974, Ser. No. 446,335

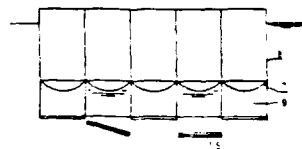
Claims priority, application Norway, May 2, 1972, 1541 72  
Int. Cl. E02D 7/00, B63C 1/00, B63B 35/44

U.S. Cl. 61-46.5 4 Claims

A method is provided for the production of a support structure for supporting a platform above the surface of the sea. The support itself comprises a base which rests on the sea bed and which includes a plurality of depending cells which are open at the bottom and which can be pressed down into the deeper layers of the sea bed. The process includes the steps of (1) constructing at least a portion of the cells of the base of the support structure in dry dock; (2) enclosing the bottoms of the cells with temporary bottom closures to form a series of buoyancy chambers; (3) floating the partially constructed base in deep water; and (4) completing the construction of the support structure in deep water, the temporary bottom closures being removed after the support structure has sufficient self-floating capability.

Keywords: Offshore caisson; Offshore construction; Seabed foundation

U.S. Cl. X.R. 61-50; 114-65A



3,906,790

# APPARATUS FOR MEASURING FLUIDIC CURRENT

Edward C. Brainard, II, Marion, and John L. Layport, Mattapoisett, both of Mass., assignors to Environmental Devices Corporation, Marion, Mass.

Filed Nov. 1, 1973, Ser. No. 411,646

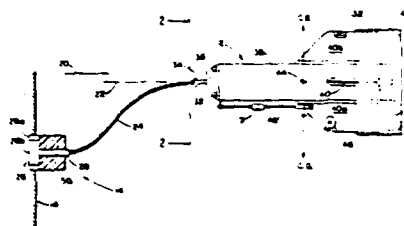
Int. Cl.<sup>2</sup> G01F 15/18

U.S. Cl. 73-170 A

13 Claims

Fluidic current measuring apparatus has a current sensing unit of selected geometrical configuration, buoyancy and trim to maintain close alignment with a generally horizontal current being measured. Further, an attachment of the sensing unit to a mooring provides multi-axis freedom of motion for the unit to preserve the desired alignment in the presence of wave action and mooring motion. This attachment to a vertically extending mooring includes a swivel connection to the mooring, a horizontally extending arm fixed to the swivel connection, and a flexible tether suspending the sensing unit from the arm.

Keywords: Buoy mooring system; Current measurement; Instrument deployment



3,907,684  
**ROTARY OIL RECOVERY DEVICE WITH  
 NON-INTEGRAL COLLECTING HEAD**  
 Frank Galicia, 5043 Catherine St., Philadelphia, Pa. 19143  
 Filed Apr. 18, 1973, Ser. No. 352,208 The portion of the term  
 of this patent subsequent to May 30, 1989, has been  
 disclaimed.

Int. Cl. E02b 15/04

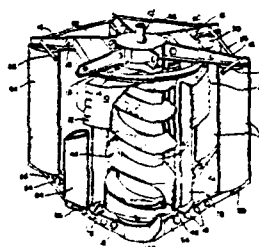
U.S. Cl. 210-242

9 Claims

A recovery device for the removal of a less dense liquid from a more dense one which has particular application for the recovery of oil from bodies of water. The device floats and has a number of improved features over previous similar devices which contribute to improved flow characteristics of the contaminated liquid as it passes through the separation stages. A rotatable collecting head may be driven at a variable speed ratio to the remainder of the separation apparatus to regulate the intake of the contaminated liquid and streamlined construction of the separation apparatus is disclosed having an improved filtering means.

Keywords: Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.21



3,907,685  
**BELT DEVICE FOR COLLECTING FLOATING MATTER  
 FROM WATER SURFACE**

Kuninori Aramaki, Yokohama; Hiroshi Kawakami, Kamakura, and Masao Suzuki, all of Japan, assignors to Bridgestone Tire Company Limited, Tokyo, Japan  
 Filed July 8, 1974, Ser. No. 486,723

Claims priority, application Japan, July 10, 1973, 48-81597[U]

Int. Cl. E02B 15/04

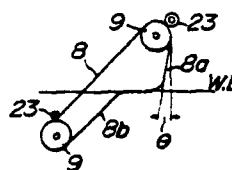
U.S. Cl. 210-242

9 Claims

A belt device for collecting floating matter from a water surface comprising a pair of pulleys, one of which being arranged above the water surface and the other pulley being arranged below the water surface, and an endless belt loosely engaged with the pulleys and having a lower loosening portion inclined from a relative direction of water flow by an acute angle.

Keywords: Pollutant, mechanical removal;  
 Pollutant removal watercraft

U.S. Cl. X.R. 210-400; 210-526; 210-DIG.21





SEPTEMBER 30, 1975

3,908,290

HYDRAULIC DREDGING SYSTEM AND METHOD FOR  
COLLECTING AND REMOVING MATERIAL FROM DEEP  
SEA BEDS

Elie Condolius, Grenoble, France, assignor to Societe Generale  
de Constructions Electriques et Mecaniques (ALSTHOM),  
Grenoble, France

Filed June 22, 1973, Ser. No. 372,516

Claims priority, application France, June 22, 1972,  
72,23440

Int. Cl.<sup>2</sup> E02F 3/88

U.S. Cl. 37-58

8 Claims

Hydraulic dredging system and method, more particularly for great depths, constituted by a first ship carrying the vertical material removing tube, by connection devices giving possibilities for inclining the tube about its fixing point on the ship, a collecting unit which collects the materials from the bottom of the sea and inserts them in the vertical material removing tube and a second ship providing the towing of the collecting device by use of a cable fitted with a device for lifting that device.

Keywords: Dredge, suction; Dredge ladder control

U.S. Cl. X.R. 37-72; 37-195; 37-DIG.8



3,908,291

APPARATUS FOR PREVENTING TANGLE OF ENDLESS  
ROPE IN MINING OR SEA LIFE GATHERING

Yoshio Masuda, Kohdan Jutaku 31-1, 10-1, Tamadaira 4-  
chome, Hino, Tokyo, Japan

Filed Dec. 27, 1973, Ser. No. 428,834

Claims priority, application Japan, Jan. 23, 1973, 48-9166;  
Mar. 13, 1973, 48-28531

Int. Cl.<sup>2</sup> E02F 3/14, A01K 74/00, 79/00

U.S. Cl. 37-69

9 Claims

Apparatus for preventing tangling of an endless rope continuously lowered from, and raised onto, a ship moving in water, including placing inclined resistance plates or other materials having the same effect on the endless rope at suitable intervals to increase the distance of separation of the descending part and the ascending part of the rope from each other by the force of the water produced by the forward movement of the ship on the resistance plates. The endless rope is provided with either buckets for mining of minerals from the sea bottom or with nets for catching sea life.

Keywords: Dredge ladder control; Dredge, mechanical

U.S. Cl. X.R. 43-6.5; 198-116; 198-151;  
226-186; 226-191; 254-137; 254-175.5



3,908,384  
BREAKWATERS FOR LONG, SHORT AND/OR COMPLEX  
WATER WAVES

Kurt P. H. Frey, Newark, Del., assignor to Sigrid F. Bulekjian,  
Arcadia, Calif., a part interest  
Filed Sept. 14, 1973, Ser. No. 397,535  
Int. Cl.<sup>2</sup> E02B 3/06

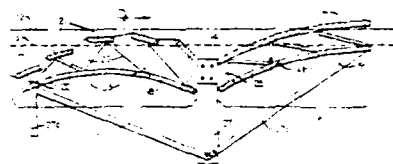
U.S. Cl. 61-4

10 Claims

This invention relates to a breakwater, especially for use where a large range of wavesteeptness (i.e., ratio of wave height to wave length) is encountered, such as in coastal regions of oceans and large lakes. This new breakwater is a composite device and comprises two different kinds of breakwaters. The component located first in the path of approaching waves is a breakwater particularly adapted to dampen waves of large wave steepness by creating numerous starting and stopping vortices. This first breakwater may take the form of a series of vanes at different depths. The second breakwater in the path of the approaching waves is adapted to dampen waves of a large range of wave steepness. This second type of wavebreaker is preferably a curved plate with the convex side up as viewed from above, and is preferably in the form of a continuous surface. These two types of breakwaters have now been coordinated to create mutual interaction such that the first breakwater reduces wave energy sufficiently so that the second type of breakwater can safely complete the desired wave attenuation, even in stormy weather.

Keywords: Breakwater, floating; Breakwater, steel frame

U.S. Cl. X.R. 61-5



3,908,386  
ROCK BOLT FOR REMOTE INSTALLATION  
Chester L. Williams, 347 Greenbriar, S.E., Grand Rapids,  
Mich. 49506  
Continuation of Ser. No. 60,427, Aug. 3, 1970, abandoned.  
This application Apr. 25, 1972, Ser. No. 247,396  
Int. Cl.<sup>2</sup> E21D 20/02

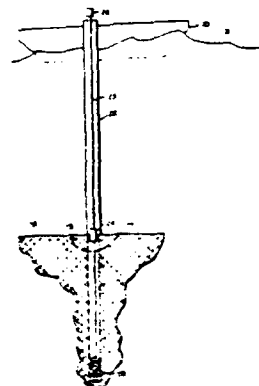
U.S. Cl. 61-35

3 Claims

A rock bolt having an anchor device set by rotation of the bolt rod, and incorporating means for inhibiting back-rotation of the bolt rod out of the anchor device as reverse torque is applied in disengaging a threaded coupling to disconnect the bolt rod from an actuating rod operated from a remote position.

Keywords: Embedment anchor

U.S. Cl. X.R. 61-45B



3,908,789

METHODS FOR GENERATING AND SHAPING A  
SEISMIC ENERGY PULSE

Oswald Alfonso Itria, Bellaire, Tex., assignor to Texaco Inc.,  
New York, N.Y.

Continuation-in-part of Ser. No. 239,530, March 30, 1972,  
abandoned. This application Oct. 30, 1973, Ser. No. 411,102  
Int. Cl.<sup>2</sup> G01V 1/30, 1/38

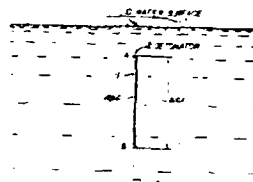
U.S. Cl. 181-113

9 Claims

In seismic delineation of sedimentary section below the surface of a seismic energy propagation medium, methods and articles for carrying out the methods are disclosed. A basic method for generating and shaping a seismic energy pulse comprises (1) generating a first energy pulse downwardly through the shortest distance to a point at the lower end of a vertical straight explosive material for forming a compressional forward portion of the seismic energy pulse, and (2) generating a second energy pulse later to form a rarefactional aft portion of the seismic energy pulse. By varying the length of the explosive material the lengths of the forward and aft portions are varied for controlling the shape of the seismic energy pulse, and by varying the position of the point of ignition of the linear explosive material, additional shaping of the seismic energy pulse results. A basic article for carrying out the above method comprises a vertical straight explosive material, as a straight piece of "Primacord," suspended at a desired predetermined depth, cut to a predetermined length, and detonated by a blasting cap at a predetermined position from the upper end to the lower end for producing a seismic energy pulse of the desired shape, a very thin elongated shape being preferable for attenuation of both the secondary bubble amplitude and time duration.

Keywords: Seismic explosive acoustic transmitter

U.S. Cl. X.R. 181-115; 181-116



3,909,416

METHOD AND APPARATUS FOR SEPARATING LIQUIDS  
OF DIFFERENT SPECIFIC GRAVITIES FROM A  
MIXTURE OF THE SAME

Cornelis In't Veld, Vlaardingen, Netherlands, assignor to Hydrovac Systems International, Inc., New York, N.Y.

Filed June 23, 1971, Ser. No. 155,815

Claims priority, application Netherlands, Nov. 10, 1970,  
7016406

Int. Cl.<sup>2</sup> E02B 15/04

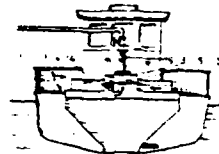
U.S. Cl. 210-242

1 Claim

A barge for separating oil-water mixtures comprises a sealed tank into which the mixture is pumped for gravity separation. Pumping is effected by withdrawing the separated water from the bottom of the tank by means of a pump that produces a negative pressure in the tank, and this negative pressure sucks up the oil-water mixture from the surface of the water, without subjecting the mixture to mechanical pumping. An intake pipe for the mixture has a cylindrical basket at its intake end surrounded by a cylindrical casing open at its top and closed at its bottom. The intake pipe opens upwardly into the tank, and water is withdrawn from the lower end of the downwardly converging walls of the tank.

Keywords: Pollutant removal watercraft; Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.21



3,909,417

DEVICE FOR DAMPING THE SURGE OF WATER WAVES  
PARTICULARLY FOR A FLOATING BODY DESIGNED  
TO CLEAN POLLUTED WATER

Jonann Rafael, Maxstrasse 36, Salzburg, Austria  
Filed Sept. 25, 1973, Ser. No. 400,632

Claims priority, application Germany, Sept. 25, 1972,  
2246957

Int. Cl.<sup>2</sup> E02B 15/04

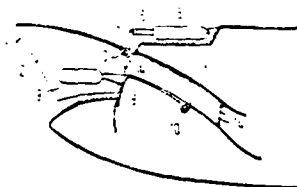
U.S. Cl. 210-242

8 Claims

A device for damping the surge of water waves on a floating body designed to clean polluted water, the damping body being pivotably hinged as an outrigger onto the floating body and the damping body having a fin which extends substantially parallel to the surface of the water, and the damping body being connected to a damping feature for the oscillations caused by the water waves.

Keywords: Pollutant collection; Pollutant removal watercraft

U.S. Cl. X.R. 210-DIG.21



3,909,774

CONTROLLED BUOYANCY SYSTEM FOR SEISMIC  
STREAMER SECTIONS

George M. Pavey, Jr., Dallas, Tex., assignor to Whitehall Corporation, Dallas, Tex.

Filed July 25, 1974, Ser. No. 491,931

Int. Cl.<sup>2</sup> B63B 21/00, 21/56

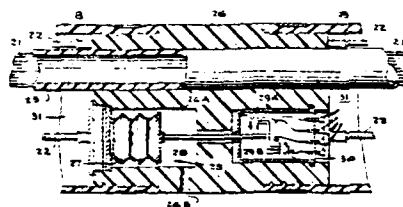
U.S. Cl. 340-7 PC

6 Claims

The subject matter of this application relates to a system for controlling the buoyancy of an elongated expandable, flexible liquid filled, marine seismic detection streamer by providing a pressure sensing switch assembly within the submerged streamer which includes a pressure sensing element exposed to the water pressure at the streamer depth and electrical contacts for operating an inlet valve and an exhaust valve upon downward or upward deviation of the streamer depth from a predetermined depth to admit additional quantities of a buoyancy control liquid from a supply line to the streamer to increase buoyancy or for discharging the control liquid from the streamer for decreasing buoyancy.

Keywords: Seismic streamer cable; Towed body depth control

U.S. Cl. X.R. 114-235B; 181-112; 340-3T;  
340-7R; 340-8



OCTOBER 7, 1975

3,909,960  
LOOSE MATERIAL RECOVERY SYSTEM HAVING A  
MIXING BOX

Frederick M. Casciano, Honolulu, Hawaii, assignor to University of Hawaii, Honolulu, Hawaii

Filed May 29, 1973, Ser. No. 364,870

Int. Cl.<sup>2</sup> E02F 3/92

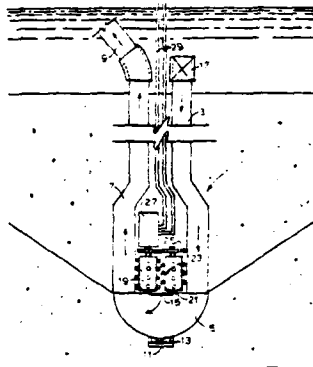
U.S. Cl. 37-63

11 Claims

Reversely forcing water through a recovery head closes a valve in an intake tube and jets water out of the bottom of the head, burrowing the head downward along a guide pipe deep into a sand deposit. Crusher rollers at a sand intake break large objects, and sand flows through a control valve into a mixing box at the bottom of the head. Water flows downward through a tube into the mixing box, and a slurry is drawn out by a suction pump at the end of a long flexible tube. The slurry is discharged on a sand accumulation point. After a large crater-like volume of sand is removed, the head is moved by lifting it with a drum-like crane, which is controlled by selectively balancing air and water within the drum.

Keywords: Dredge, cutterhead; Dredge, suction; Dredge intake

U.S. Cl. X.R. 37-65; 37-72; 241-46.11; 241-236; 302-15; 302-57



3,910,057  
SUBMARINE CARGO TERMINAL

George E. Fenton, Newport News, Va., assignor to Newport News Shipbuilding and Dry Dock Company, Newport News, Va.

Filed Aug. 16, 1974, Ser. No. 497,980

Int. Cl.<sup>2</sup> B63C 1/100; B63B 21/00

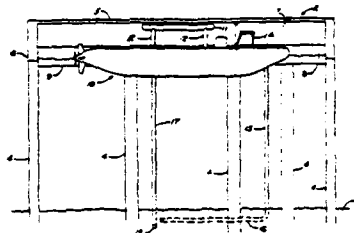
U.S. Cl. 61-46

1 Claim

This invention consists of a terminal for use in the marine transportation of cargo from, to or through regions in which surface transportation is undesirable. The apparatus in which the cargo is transported is a submarine cargo vessel. This submarine cargo vessel is loaded and unloaded at an underwater terminal comprising a structure functioning much as an underwater hangar such that the submarine cargo vessel may "surface" underwater where it may be loaded or unloaded and where certain work may be performed on the vessel.

Keywords: Offshore mooring structure; Offshore platform, fixed

U.S. Cl. X.R. 114-230



237

3,910,058

# CONSTRUCTION OF IMMERSED STRUCTURES

Paul H. Fouillade, Neuilly-sur-Seine, France, assignor to  
Dumex Travaux Publics, Nanterre, France, a part interest  
Filed July 2, 1974, Ser. No. 485,102

Claims priority, application France, July 5, 1973, 73.24817  
Int. Cl.<sup>2</sup> E21D 9/24

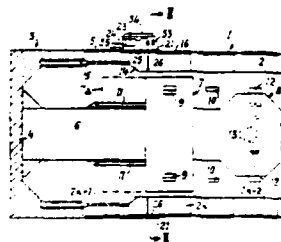
U.S. Cl. 61-85

7 Claims

Process and apparatus for producing a seal between a caisson shield and the end portion of a linear immersed structure which is being constructed in which the caisson has a hollow, tubular skirt which surrounds and is slightly spaced from the previously formed portion of the structure to provide an annular space between the skirt and said portion. At its free end, the skirt carries an elastic seal which contacts the structure and seals one end of said space against the ingress of fluid, and a ring within the skirt and adjacent the end of said portion of the structure and provided with elastic seals engaging respectively the end of the structure and the interior of the skirt seals the opposite end of said space. Refrigerated water is supplied to said space from the skirt and the hollow portion of the skirt has at least one cooling coil through which a refrigerating fluid is passed to freeze the water in said space and thereby form a sealing plug of ice between the skirt and said portion of the structure.

Keywords: Offshore caisson; Offshore construction; Seabed pipeline placement; Seabed water, process structure

U.S. Cl. X.R. 61-36A; 61-43



3,910,111

# WAVE HEIGHT MEASURING DEVICE

George E. Mott, and Robert L. Skaggs, both of Metairie, La.,  
assignors to Texaco Inc., New York, N.Y.

Filed May 1, 1972, Ser. No. 248,995

Int. Cl.<sup>2</sup> G01B 17/00

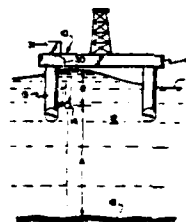
U.S. Cl. 73-170 A

8 Claims

The invention relates to a wave measuring instrument for use on a dynamically positioned or tethered floating vessel whereby to continuously monitor wave height, wave period and vertical heave of the vessel as the vessel responds to waves, swell and currents. The instrument comprises a measuring device connected to the vessel hull in a substantially submerged position whereby to continuously record the distance between the instrument and the ocean floor as the vessel heaves. A second measuring means automatically gauges and records the normally varying distance between the instrument and the water's surface, which distance results from the usual presence of wave action whether the latter be gradually rolling or relatively turbulent.

The respective measurements thus obtained are thereafter integrated and compensated for to provide a relatively accurate record of the actual wave height between trough and crest, the wave period, and the vertical movement or heave of the vessel.

Keywords: Offshore platform, floating; Wave measurement



238

3,910,218

**PROPELLANT-ACTUATED DEEP WATER ANCHOR**

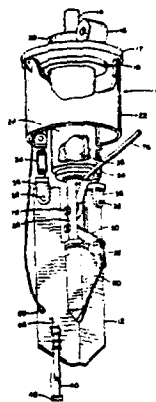
Robert J. Taylor, Camarillo, and Richard M. Beard, Oxnard, both of Calif., assignors to The United States of America as represented by the Secretary of the Navy, Washington, D.C.  
Filed Feb. 4, 1974, Ser. No. 439,486  
Int. Cl.<sup>2</sup> B63B 21/28

**Keywords:** Embedment anchor

U.S. CL 114-206 A

15 Claims

A propellant-actuated direct embedment anchor which utilizes simplified structural shapes and provides a rapid keying feature which allows the most efficient use of penetration energy. The anchor system has two major parts; a launch vehicle and a projectile which include a piston and fluke. Two different fluke designs are provided to satisfy the realm of anticipated seafloor conditions (sand, clay, and rock). The flukes designed for said sand and clay are similarly configured plate-like projectiles which only differ in length. The fluke designed for rock anchoring is a three-fin, arrowhead-shaped projectile, specially configured to penetrate rock and resist a specified pull-out load. The launch vehicle consists of a launching system, a reaction vessel and a firing mechanism. The firing mechanism is comprised of a weighted touch-down rod with a square base pad and a safe-and-arm device. The sand and clay flukes use a quick-keying design to maximize efficiency and holding power after embedment.



3,911,287

**WAVE DRIVEN POWER GENERATORS**

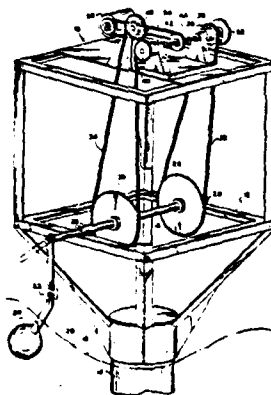
Robert Lee Neville, 1180 Hailman, Lake Oswego, Oreg. 97034  
Filed Mar. 13, 1974, Ser. No. 450,736  
Int. Cl.<sup>2</sup> F03B 13/12

**Keywords:** Power, tide; Power, wave

U.S. CL 290-53

5 Claims

Two one-way clutches on a power output shaft are driven through two oppositely driven power trains driven by a lever arm oscillated by a float raised by waves and lowered by gravity. In an alternate embodiment, a plurality of float-oscillated lever arms are spaced apart a fraction of a wave length and drive pairs of one-way clutches on a power output shaft which drives a positive displacement pump. Another embodiment includes a paddle wheel carried by a lever arm oscillated by a float raised and lowered relatively rapidly by waves and relatively slowly by tide, a power output shaft driven unidirectionally by oppositely driven power trains through two one-way clutches, and a current driven paddle wheel carried by the arm and driving the shaft through two additional one-way clutches.



OCTOBER 14, 1975

3,911,687

FOUNDATION METHOD FOR CAISSONS

Olav Mo, Grønsundveien 94, 1370 Asker, Norway

Filed Apr. 19, 1973, Ser. No. 352,679

Claims priority, application Norway, May 2, 1972, 1541,72

Int. Cl.<sup>2</sup> E02D 17/00, 23/02

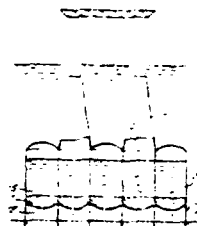
U.S. Cl. 61-46.5

15 Claims

A support structure for providing a support for a marine structure to be submerged onto a submarine bed. The support structure includes a base which is intended to rest on the sea bed. The base includes three or more cells, and three or more hollow downwardly open skirts which project downwardly from the lower portion of the base. The skirts are each formed as a static and continual unit with the portion and have a length which enables each to be pressed far down into the sea bed, whereby the deeper layer of the sea bed soil cooperate directly with the skirts to support the marine structure in position on the sea bed. The skirts, which have a substantially cylindrical cross-section, being located at least along the periphery of the base in such a way that a continuous barrier wall is formed along the periphery of the base.

Keywords: Offshore caisson; Offshore construction; Seabed foundation

U.S. Cl. X.R. 61-30



3,912,042

STEAM IMPLODER

Joseph Pauleich, 92-18 43rd Ave., Elmhurst, N.Y. 11373

Filed June 20, 1974, Ser. No. 481,067

Int. Cl. H04b 13/00; G01v 1/02, 1/38

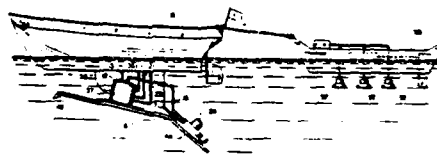
U.S. Cl. 181-118

4 Claims

An underwater sound imploder adapted for use in the exploration of minerals existing under the sea bed. The imploder consists of a combination underwater shell having a fire chamber communicating therewith and mechanism for introducing to the shell separately a fuel and oxygen or, alternatively, remotely generated steam sporadically or in bursts whereby there is produced continuous underwater implosions causing bursts of sounds under the surface of the water directed by the shell in the general direction of the water's bottom.

Keywords: Seismic implosive acoustic transmitter

U.S. Cl. X.R. 181-120; 340-7; 340-8FT; 340-17





3,912,635  
**DEVICE FOR RECOVERING POLLUTING PRODUCTS  
 SPREAD OVER THE WATER SURFACE, IN PARTICULAR  
 OIL PRODUCTS**

Paul Degobert; Francois Kermarrec, both of Rueil-Malmaison,  
 and Yvon Nadaud, Saint-Ouen, all of France, assignors to  
 Institut Francais du Pétrole, des Carburants et Lubrifiants,  
 France

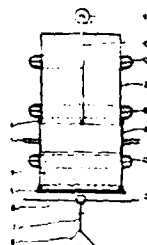
Filed Aug. 24, 1973, Ser. No. 391,520  
 Claims priority, application France, Sept. 18, 1972,  
 72,33068

Int. Cl.<sup>2</sup> E02B 15/04  
 U.S. Cl. 210—242 14 Claims

A device for recovering polluting liquids spread over  
 the water surface, comprising at least one floatable  
 container having a porous hydrophobic wall which is  
 easily wettable by these polluting liquids. The con-  
 tainer includes a recess limited by an impervious wall,  
 in combination with means for transferring into this  
 recess the polluting liquids which have selectively tra-  
 versed the porous wall.

Keywords: Pollutant, mechanical removal

U.S. Cl. X.R. 210-DIG.21



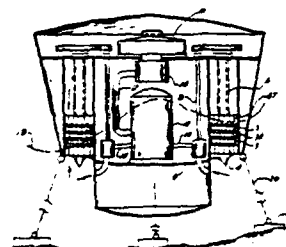
3,912,938  
**ELECTRICAL STATIONS OPERATED BY WAVES**  
 Gregory D. Filipenco, 158 Green St., New York, N.Y.

Filed Jan. 25, 1974, Ser. No. 436,623  
 Int. Cl.<sup>2</sup> F03B 13/12  
 U.S. Cl. 290—53 3 Claims

Electrical energy is produced by platforms floating  
 upon water expanse oceans, seas, rivers or lakes, and  
 movable by waves. The platforms carry electrical gen-  
 erators as well as means transforming the kinetic en-  
 ergy of the waves into mechanical energy which actu-  
 ates these generators. These means may consist of hy-  
 draulic turbines combined with a pump water accumu-  
 lator capable of transmitting water under pressure to a  
 hydraulic motor operating the electrical generator.  
 Other means may include floats or a pendulum swing-  
 ing under the action of the waves.

Keywords: Electrical generator; Offshore  
 platform, floating; Power, wave

U.S. Cl. X.R. 290-42; 417-330



OCTOBER 21, 1975

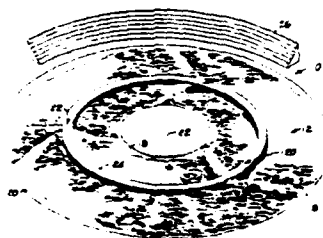
3,913,332  
**CONTINUOUS WAVE SURFING FACILITY**  
 Arnold H. Forsman, 347 Ilo Lane, Danville, Calif. 94526

Filed Aug. 30, 1973, Ser. No. 393,130  
 Int. Cl.<sup>2</sup> E02B 3/00; E04H 3/18  
 U.S. Cl. 61—1 R 5 Claims

A facility is provided having a body of water and wave  
 generator for producing a continuous wave suitable  
 for surfing. A plurality of generators provides serial  
 waves on opposite sides of a tunnel structure having  
 screen grills for preventing surfers from colliding with  
 the wave generators. Both double bladed and alterna-  
 tively single bladed wave generators are provided.

Keywords: Wave flume; Wave generator

U.S. Cl. X.R. 4-172.16



3,913,333

MEANS AND APPARATUS FOR CONTROLLING FLUID CURRENTS AND SELECTIVELY PRESERVING AND MODIFYING TOPOGRAPHY SUBJECTED THERETO  
Tom Watson Hubbard, Jr., 1213 Big Oak Lane, Sarasota, Fla. 33580

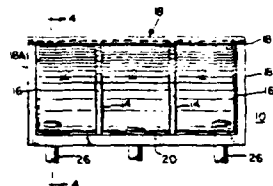
Filed Sept. 18, 1973, Ser. No. 398,305  
Int. Cl. E02B 3/06

U.S. Cl. 61-4

5 Claims

Modular units are provided for utilizing the kinetic energy in waves, tides and winds to effect deposits of fluid entrained alluvium. The modules have front and rear surfaces so structured that arrays of the modules can effect shaped alluvial deposits or selective entrainment of alluvium to maintain or modify the topography at the situs of the arrays.

Keywords: Breakwater, concrete; Channel protection; Dune protection; Sand fence; Seawall; Tidal inlet



3,913,335

OFFSHORE TERMINAL

Sigurd Heien, Aslokkveien 82, 1362 Billingstad, Norway  
Filed July 25, 1973, Ser. No. 382,505  
Int. Cl. E02b 17/00; B65d 11/00; B65g 5/00

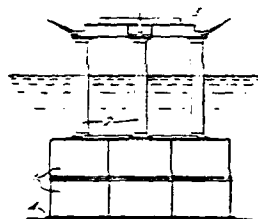
U.S. Cl. 61-46.5

8 Claims

An offshore terminal comprising a number of axially and radially interconnected containers sunk to stand on the sea bed and extending above the sea surface, which containers have a polygon bottom which protrude from the container wall and match each other to form a continuous bottom of the terminal and closed hollows between the containers for interconnecting and ballasting purposes.

Keywords: Offshore caisson; Offshore platform, fixed; Offshore storage tank, submerged; Seabed foundation; Seabed scour protection

U.S. Cl. X.R. 52-192; 61-50; 220-18



3,913,384

WATER QUALITY DETERMINATION APPARATUS

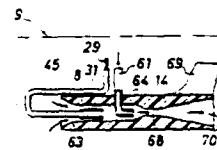
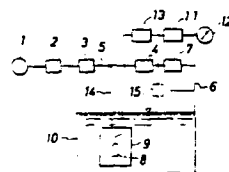
Noboru Furuya; Eiji Fujimoto; Kenichi Amano; Tsunao Tsukamoto, and Nobuyuki Sato, all of Tokyo, Japan, assignors to Kabushiki Kaisha Meidensha, Tokyo, Japan  
Filed Jan. 28, 1974, Ser. No. 437,350  
Int. Cl. G01N 33/18

U.S. Cl. 73-53

27 Claims

An apparatus comprising a sensor element immersed in a liquid to be examined for determining the amount of a matter in the test liquid which amount will be an index of the characteristics of the test liquid and means for moving the sensor element and test liquid relative to each other to clean the sensor element of sludge, oil and the like adhered thereto. The sensor element is accommodated in a housing and has a sensing face disposed parallel to the flow direction of the test liquid passing through the housing. In another embodiment of the invention, means is provided for generating pressure waves in the test liquid in contact with the sensing face of the sensor element to clean the sensing face of contaminants adhered thereto.

Keywords: Pollutant measurement



OCTOBER 28, 1975

3,914,947

**SUBAQUATIC STRUCTURE**

Jacques Edouard Lamy, Fontenay-aux-Roses, France, assignor to C. G. Doris, Paris, France  
Continuation-in-part of Ser. No. 391,465, Aug. 24, 1973, Pat. No. 3,878,684, which is a continuation-in-part of Ser. No. 358,500, May 9, 1973, Pat. No. 3,846,988. This application Apr. 16, 1974, Ser. No. 461,347

Claims priority, application France, Sept. 15, 1972, 72.32847

Int. Cl.<sup>2</sup> E02B 17/00, 3/04

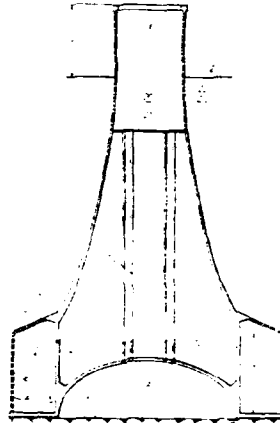
U.S. Cl. 61-46.5

7 Claims

A device for protecting a structure having a foot which rests on the bed of the sea or a like body of water, to prevent undermining of the bed by movements of water at the foot of the structure, comprising a caisson integral with the structure around the foot and having an outer wall and a multiplicity of holes there-through. Water flows in an average direction towards the inside of the caisson through the lower holes and towards the outside through the upper holes. The holes can be plugged releasably to form a buoyant caisson during construction of the structure.

Keywords: Offshore caisson; Offshore platform, fixed; Seabed foundation; Seabed scour protection

U.S. Cl. X.R. 61-3; 61-5



3,915,257

**AIR CUSHION SEISMIC SOURCE**

Henry F. Dunlap, and Henry B. Ferguson, both of Dallas, Tex., assignors to Atlantic Richfield Company, Los Angeles, Calif.  
Continuation of Ser. No. 277,366, Aug. 2, 1972, abandoned, which is a continuation-in-part of Ser. No. 39,590, May 22, 1970, abandoned. This application Sept. 20, 1973, Ser. No. 399,177

Int. Cl.<sup>8</sup> G01V 1/02

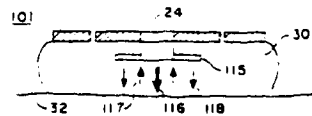
U.S. Cl. 181-114

3 Claims

A seismic pressure pulse generator, e.g. air gun or gas exploder, is mounted on a ground effect machine so that it fires into the air cushion supporting the machine. The pressure pulse thus generated is coupled and transmitted to the earth surface beneath the machine producing a seismic impulse or wave.

Keywords: Seismic explosive acoustic transmitter

U.S. Cl. X.R. 181-401



3,915,864

**VESSEL FOR REMOVING LIQUID CONTAMINANTS  
FROM THE SURFACE OF A WATER BODY**

Ornella Massei, Leghorn, Italy, assignor to Co. Ba. Di. Costruzioni Battelli Disinquinanti S.p.A., Rome, Italy

Filed Mar. 25, 1974, Ser. No. 454,641

Claims priority, application Italy, Mar. 27, 1973, 67871/73  
Int. Cl.<sup>7</sup> E02B 15/04

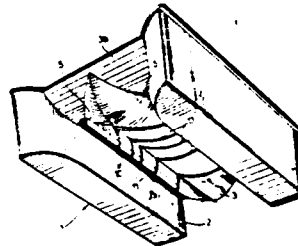
U.S. Cl. 210-242

11 Claims

A vessel for use in removing a floating contaminant liquid such as oil from the surface of water has a hull forming an immersed inverted channel into which surface layers flow as the vessel advances, the hull being shaped so as to guide the liquid into accumulation zones from which the liquid is drawn by a pump into settling tanks disposed in pontoons on each side of the hull, the water being discharged from the tanks and the contaminant liquid being collected in the tanks and react

Keywords: Pollutant removal watercraft;  
Pollutant, suction removal

U.S. Cl. X.R. 210-242



NOVEMBER 4, 1975

3,916,632

**TELESCOPIC CAISSON WITH INTERMEDIATELY  
POSITIONED WELLHEAD**

John P. Thomas, New York, N.Y., assignor to Interseas Associates, New York, N.Y.

Filed May 6, 1974, Ser. No. 467,236

Int. Cl.<sup>7</sup> E02B 17/04; E02D 29/00; E21B 15/02

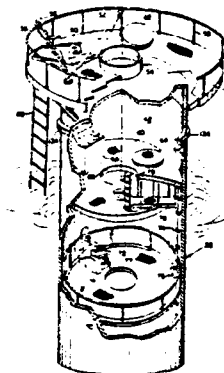
U.S. Cl. 61-46

10 Claims

A fixed caisson is installed in the ocean floor and a telescopic caisson is movably mounted within the fixed caisson for movement between a retracted position well below the water surface and an extended position above the surface. At least one wellhead is positioned within the fixed caisson relatively adjacent the top thereof and is accessible to service by divers when the telescopic caisson is retracted. Ambient or atmospheric pressure can be maintained within the telescopic caisson, and the wellhead is maintained in a dry condition in both the extended and retracted positions of the caisson.

Keywords: Offshore caisson; Offshore Platform, fixed; Seabed foundation

U.S. Cl. X.R. 61-69; 61-81; 175-7



3,916,633

**MEANS FOR ALTERING MOTION RESPONSE OF  
OFFSHORE DRILLING UNITS**

Peter M. Lovie, and Edwin L. Lowery, both of Houston, Tex.,  
assignors to Engineering Technology Analysts, Inc., Hous-  
ton, Tex.

Filed Aug. 24, 1973, Ser. No. 391,070

Int. Cl.<sup>2</sup> E02B 17/00; E02D 5/72

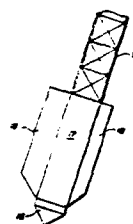
U.S. Cl. 61-46.5

2 Claims

An offshore drilling unit of the self-elevating type having a floatable hull and a plurality of legs movable from a raised position to a lowered position. Apparatus is attached to the legs for altering the response of the unit to movement of the body of water in which the unit is deployed. Apparatus for altering such response may comprise plating on the sides of the lower portions of the legs, longitudinal fins attached to the lower leg portions, flexible bags carried in the lower portions of the legs or any combination of such apparatus. The unit may also comprise a mass carried within the legs and mounted for longitudinal movement with respect thereto for altering the response of the drilling unit to water body movements. The movable mass may be used in conjunction with any of the other apparatus.

Keywords: Offshore platform, jack up;  
Offshore platform, leg

U.S. Cl. X.R. 37-73; 61-53



3,916,674

**OIL-SPILL DETECTION SYSTEM**

Gordon H. Miller, Richmond, and Edward O. Renick, Jr.,  
Sandston, both of Va., assignors to Texaco Inc., New York,  
N.Y.

Filed Feb. 22, 1974, Ser. No. 444,934

Int. Cl.<sup>2</sup> G01N 27/22

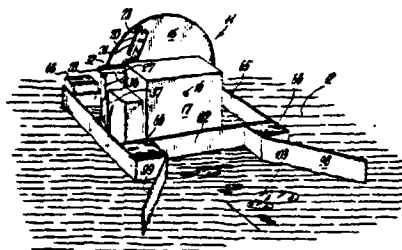
U.S. Cl. 73-61.1 R

8 Claims

An oil-spill detection instrument which employs a rotating disc that is partially submerged in the body of water to be monitored. There is a doctor blade for removing adhering liquids from the surface of the disc, which liquids are accumulated in a settling vessel. Overflow is directed to apparatus for detecting the presence of oil. The sensitivity of the instrument is good without being too delicate.

Keywords: Buoy, instrumented; Pollutant  
measurement; Pollutant, mechanical  
removal

U.S. Cl. X.R. 324-65R; 340-236



245

3,917,528  
FORAMINOUS COMPOSITION FOR REMOVAL OF  
OLEOPHILIC MATERIAL FROM THE SURFACE OF  
WATER

Julius Orban, Covina, Calif., and Charles E. Case, Summit,  
N.J., assignors to Sorbent Sciences Corporation, Covina,  
Calif.

Filed May 29, 1973, Ser. No. 364,777  
Int. Cl.<sup>2</sup> C02B 9/02

U.S. Cl. 210-36

10 Claims

A composition employed to sorb oleophilic material from a surface, especially a composition to preferentially sorb an oleophilic substance from a hydrophilic substance, e.g., comprising a foraminous substrate impregnated with a drying oil; a method of removing an oleophilic material from a surface which comprises contacting the same with a composition comprising a foraminous substrate, said substrate impregnated with a drying oil; a method of removing an oleophilic liquid from a hydrophilic liquid which comprises contacting a mixture thereof with a foraminous substrate impregnated with a drying oil.

Keywords: Pollutant absorption

U.S. Cl. X.R. 117-138.8D; 134-6; 210-40;  
210-DIG.21

No Figure

NOVEMBER 11, 1975

3,918,260  
WAVED-POWERED DRIVING APPARATUS  
Klaus M. Mahneke, 228-66th St., Delta, British Columbia,  
Canada

Filed Dec. 30, 1974, Ser. No. 537,578  
Int. Cl.<sup>2</sup> F03G 7/00

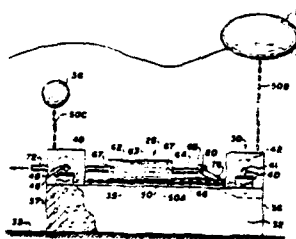
U.S. Cl. 60-500

5 Claims

Driving apparatus operable by wave action and having a flexible member connecting a small subsurface float to a relatively large surface float. The apparatus includes spaced pulleys supported near the ocean floor by a heavy anchor with an intermediate portion of the flexible member trained over the pulleys so that the pulleys are rotated by the reciprocating flexible member as the floats rise and fall due to wave action. Rotational movement of one or both of the pulleys is transmitted to a shaft which is utilized as a power take-off shaft to drive a machine or the like.

Keywords: Buoy mooring system; Power, wave

U.S. Cl. X.R. 60-504; 417-330



3,918,261

WAVE AND TIDE MOTOR

Vernon Bailey, 2424 Peach Orchard Road, Augusta, Ga. 30906

Filed Apr. 10, 1974, Ser. No. 459,494

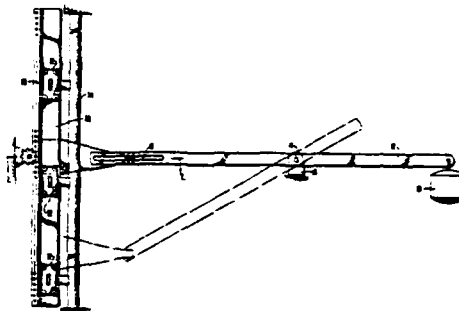
Int. Cl.<sup>2</sup> F03G 7/00

U.S. Cl. 60—506

1 Claim

An operating lever having a float secured to one end thereof is pivoted intermediate its ends for oscillating movement in a vertical plane. An elongated channel shaped member having a rack secured thereto is guided for vertical movement along its length and is connected to the other end of the operating lever by a lost-motion connection. A pinion is mounted in meshing engagement with the rack and can be operatively connected to any suitable power generating means.

Keywords: Power, tide; Power, wave



3,918,381

BOTTOM-DUMP VESSELS

Bartele van der Werff, Medemblik, Netherlands, assignor to A Vuyk & Zonen's Scheepsverven B.V., IJssel, Netherlands

Filed Mar. 27, 1974, Ser. No. 455,282

Claims priority, application Netherlands, Mar. 29, 1973, 7304384

Int. Cl.<sup>2</sup> B63B 35/30

U.S. Cl. 114—29

3 Claims

A bottom-dump vessel having two longitudinal hull sections forming air cases or pontoons hinged together for movement about a longitudinal axis. An intermediate section arranged at least partially in a recess between the two longitudinal hull sections. The intermediate section is hinged with port and starboard hinges to the two longitudinal hull sections.

Keywords: Hopper barge



3,918,384

FENDER

Werner Bröwe, Hamburg, Germany, assignor to Schlegel GmbH vormals Weill & Reineke, Germany

Filed Aug. 20, 1973, Ser. No. 392,610

Int. Cl.<sup>2</sup> B63B 59/02

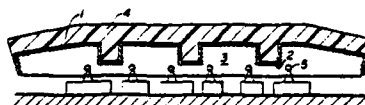
U.S. Cl. 114—219

6 Claims

The present invention relates to a fender consisting of a carrier body and a pad made of plastic material whose surface presents a reduced coefficient of friction.

Keywords: Pier fender

U.S. Cl. X.R. 61-48



3,918,827

**FUEL LESS WATER PRESSURE MACHINE**

John L. Conn, c/o George Spector, 3615 Woolworth Building,  
233 Broadway, and George Spector, 3615 Woolworth  
Building, 233 Broadway, both of New York, N.Y. 10007  
Filed Nov. 19, 1974, Ser. No. 525,056  
Int. Cl.<sup>2</sup> F03G 3/00, 7/00, 7/10

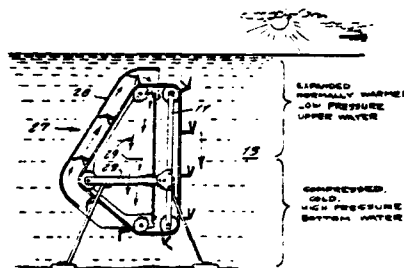
U.S. Cl. 415-5

3 Claims

A machine that includes the use of water pressure as an additional force for operation thereof; the device consisting of a relatively very tall frame submerged underwater in a lake or sea, the frame supporting rotatable cog wheels around which an endless chain travels, the chain having a series of collapsible buckets mounted therearound.

Keywords: Power, submerged source

U.S. Cl. X.R. 60-495



3,919,083

**TREATMENT OF FLOATING POLLUTANTS**

Denis J. O'Sullivan, Sutton, and Bernard J. Bolger, Foxrock,  
both of Ireland, assignors to Loctite (Ireland) Limited, Dub-  
lin, Ireland

Continuation-in-part of Ser. No. 159,572, July 2, 1971,  
abandoned. This application Oct. 4, 1973, Ser. No. 403,701  
Int. Cl.<sup>2</sup> C02B 9/02

U.S. Cl. 210-54

12 Claims

Water-borne pollutants, particularly those of oelagi-  
nous nature, may be treated with monomers which  
polymerize in the presence of moisture, preferably,  
monomeric esters of 2-cyanoacrylic acid. Upon poly-  
merization, significant portions of the pollutant are in-  
corporated within a polymer matrix, thus reducing the  
danger to shore and marine ecology and aesthetics.

Keywords: Pollutant coalescence

U.S. Cl. X.R. 210-59; 210-DIG.21

No Figure

(248)



3,919,684

# UNDERWATER SEISMIC SOURCE AND METHOD

Dale H. Reed, Dallas, Tex., assignor to Atlantic Richfield Company, Los Angeles, Calif.

Filed Jan. 4, 1974, Ser. No. 430,641

Int. Cl.<sup>2</sup> H04B 13/00

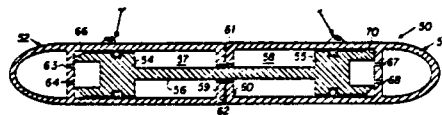
U.S. Cl. 340-8 R

2 Claims

Keywords: Seismic implosive acoustic transmitter

U.S. Cl. X.R. 181-118; 340-12R

A torpedo-shaped underwater seismic gun adapted to deliver an acoustic pulse to a submarine earth surface consists of an aft main body section and a separable forward nose section supported beneath a float in a submerged position in any desired offshore location. An axial connecting rod joins the nose section to a piston slidable within a sealed cylindrical bore extending partially along the main body section, both sections being free of external constraints on relative longitudinal movement thereof other than the resistance of the water. An air spring in the cylindrical bore behind the piston urges the main body section and the nose section together to form an interface between respective transverse external surfaces thereof. Ignition of an explosive gas mixture in front of the piston in the cylindrical bore drives the piston and the main body section in opposite directions to separate these two sections rapidly, thereby creating a low pressure bubble of condensable water vapor between the two external surfaces. Implosion of this bubble responsive to hydrostatic pressure generates a singular seismic pulse having a peak pressure on the order of  $10^4$  atmospheres.



NOVEMBER 18, 1975

3,919,790

# PUSHED SUCTION DREDGER AND BARGE COMBINATION

Michio Sasaki, Funabashi, and Keizo Kikui, Kamagaya, both of Japan, assignors to Mitsui Shipbuilding & Engineering Co. Ltd., Tokyo, Japan

Filed July 9, 1974, Ser. No. 486,871

Claims priority, application Japan, July 11, 1973, 48-78647

Int. Cl.<sup>2</sup> E02F 3/88

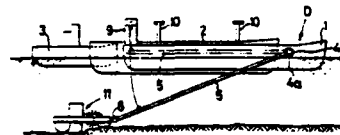
U.S. Cl. 37-66

3 Claims

Keywords: Dredge, cutterhead; Dredge intake; Dredge propulsion; Pump

U.S. Cl. X.R. 37-72; 114-235R

A dredger comprising a floating vessel and a dredging and suction unit which is tracted by the floating vessel and travelled on the sea bottom. Silt on the sea bottom is sucked by a pump provided on the dredging and suction unit and introduced into the floating vessel through conduits and subsequently delivered to a barge provided in a recess of the floating vessel. The vessel and barge are propelled by a push-boat.



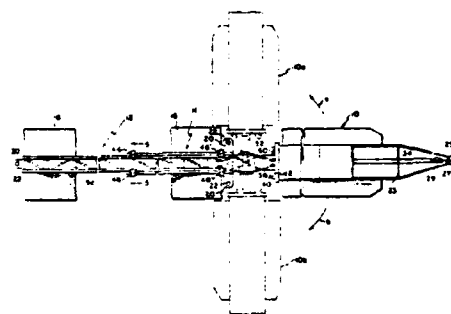
3,919,791  
**DREDGER HAVING SEPARATELY FLOATING DREDGE  
 AND TAIL SECTIONS AND METHOD OF DREDGING**  
 Leward N. Smith, Millbrook Road, Pte. 1, Remus, Mich.  
 48757

Filed Nov. 19, 1973, Ser. No. 417,097  
 Int. Cl.<sup>2</sup> E02F 3/88  
 U.S. Cl. 37-67 10 Claims

Underwater excavating apparatus including a floatable, anchorable tail section and a floatable, anchorable dredge section mounted on the tail section for longitudinal and swinging movement. The dredge section is swung relative to the tail section to dredge a swath and then advanced longitudinally relative to the tail section for cutting additional swaths. After being extended to its limit relative to the tail section, the dredge section is then anchored and the tail section unanchored and moved longitudinally up to its original position adjacent the dredge section after which the process is repeated.

Keywords: Dredge, cutterhead; Dredge ladder control; Dredge propulsion

U.S. Cl. X.R. 37-73; 37-195; 114-235R;  
 180-79.2B



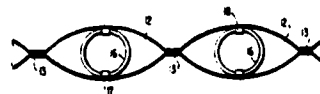
3,919,847  
**FLOATING ANTI-POLLUTION BARRIER**  
 Louis Ballu, Colombes, France, assignor to Pneumatiques,  
 Caoutchouc Manufacture et plastiques Kleber-Colombes,  
 France

Filed Nov. 27, 1973, Ser. No. 419,334  
 Claims priority, application France, Nov. 27, 1972,  
 72.42160

Int. Cl.<sup>2</sup> E02B 15/04 8 Claims  
 U.S. Cl. 61-1 F

A floating barrier intended to catch floating materials on the surface of the water and including a skirt and a floating element extending over the entire length of the skirt, characterized in that the floating element consists of a series of sealed compartments forming closed containers interlinked by a strip of fabric.

Keywords: Pollutant, surface barrier



3,920,083

**PILE DRIVING AND DRAWING APPARATUS**

Hiroomi Makita, Tokyo, Japan, assignor to Toyoda Kikai Kogyo Kabushiki Kaisha, Shizuoka, Japan

Filed May 3, 1974, Ser. No. 466,675

Int. Cl.<sup>2</sup> E02D 7/06

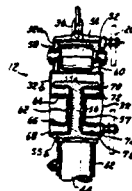
U.S. Cl. 173-49

14 Claims

Keywords: Pile driver leads; Pile driver, vibratory; Pile extractor

U.S. Cl. X.R. 61-53.5; 173-91; 175-56

A pile driving and drawing apparatus for use in foundation works, provided with a weight assembly which houses an excitor, and resilient bodies, two of which are interposed between the weight assembly and the head of a pile, another being interposed between said weight assembly and means for suspending the same. The frequency of the excitor is so designed as to coincide with the frequency of the weight assembly, the latter being dependent on one of said resilient bodies interposed between the weight assembly and the pile head, whereby the vibration of the weight assembly imparts downward driving forces to the pile head. The frequency of the excitor is also designed to coincide with the frequency of the weight assembly, the latter frequency being dependent on the other of said resilient bodies interposed between the weight assembly and the pile head as well as the resilient body interposed between said weight assembly and said suspending means, whereby the vibration of the weight assembly imparts upward driving forces to the pile for the drawal thereof.



3,920,137

**EXCAVATING MACHINE WITH CLAMSHELL BUCKET**

Willard E. McCain, 6431 W. Heidler Road, Fairview, Pa. 16415

Filed Apr. 8, 1974, Ser. No. 458,682

Int. Cl.<sup>2</sup> B66F 9/12

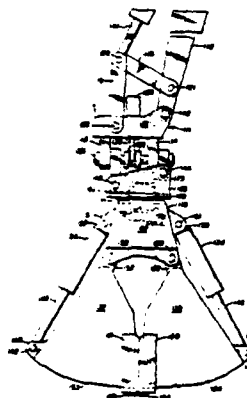
U.S. Cl. 214-140

16 Claims

Keywords: Dredge ladder control; Dredge, mechanical

U.S. Cl. X.R. 294-70; 294-88

The application discloses a backhoe dipper stick and clamshell bucket combination. A bucket support is pivoted to the dipper stick and a cylinder is connected to the dipper stick to swing the bucket about a laterally extending axis. The bucket support has downwardly extending lugs which pivotally receive a king pin. The king pin is also received in upwardly extending lugs connected to a tilt support and fixed to them. The king pin has crank arms fixed to an intermediate part of it and the crank arms are connected to the piston rod of a tilting cylinder which is supported on the bucket support. The tilting cylinder will tilt the bucket about the king pin. The tilt support has a pivot member connected to it and the pivot member is connected to a bucket bracket. The bucket bracket pivotally supports links that are fixed to each of the two buckets of the clamshell. The bucket cylinder is connected to each side of the bucket bracket and the bucket cylinders each have a piston rod connected to one of the buckets so that the buckets can be swung toward each other and away from each other providing a full clamshell bucket action. The buckets can be rotated relative to the bucket bracket.



3,921,124  
MARINE 3-D SEISMIC METHOD USING SOURCE  
POSITION CONTROL

Charles E. Payton, Ponca City, Okla., assignor to Continental  
Oil Company, Ponca City, Okla.

Filed Mar. 18, 1974, Ser. No. 451,736

Int. Cl.<sup>2</sup> G01V 1/38

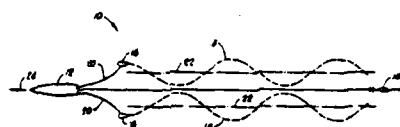
U.S. Cl. 340-7 R

15 Claims

An improved method for deriving three dimensional seismic information in a marine environment by the use of a single conventional hydrophone streamer cable and one or more remote controllable mobile seismic sources, the positions of which are systematically controlled. Movement of the seismic sources along a periodic path facilitates, through the use of well-known techniques, the determination of common depth point data along a plurality of lines parallel to the line of survey, thereby producing three dimensional seismic information.

Keywords: Seismic acoustic transmitter array;  
Seismic survey method; Seismic  
vibratory acoustic transmitter

U.S. Cl. X.R. 340-15.5CP



3,921,125  
COAXIAL ELECTRET HYDROPHONE

Gerald K. Miller, Saratoga, and Sam Lum, San Jose, both of  
Calif., assignors to GTE Sylvania Incorporated, Mountain  
View, Calif.

Filed June 28, 1974, Ser. No. 483,959

Int. Cl.<sup>2</sup> G01V 1/00

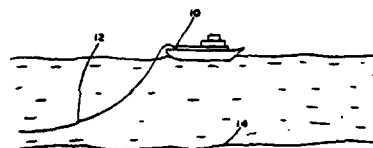
U.S. Cl. 340-7 R

4 Claims

The utility of a coaxial electret cable transducer as a hydrophone is substantially improved by securing the outer conductor of the cable to the inner surface of the resilient jacket or cover of the cable. Such cable loses transducer sensitivity after being subjected to high pressure. It has been discovered that such desensitization of the cable occurs as a result of the difference in elasticity of the outer conductor and the jacket which surrounds it; compensating for this elastic differential of these two cable parts by mechanically securing them together prevents loss of sensitivity upon depressurization.

Keywords: Seismic hydrophone; Seismic  
streamer cable

U.S. Cl. X.R. 174-107; 340-261



NOVEMBER 25, 1975

3,921,238  
DREDGE PIPE FLOTATION

Glen Johnson, Box 344, Cambridge, Minn. 55008

Filed Sept. 6, 1974, Ser. No. 503,661

Int. Cl.<sup>2</sup> B63B 35/44

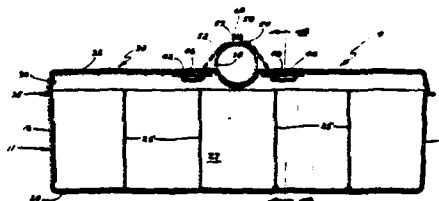
U.S. Cl. 9-1 R

1 Claim

A dredge pipe flotation device formed of a substantially hollow chambered body preferably formed of a material such as of fiberglass and having a concavity thereacross to partially receive a dredge pipe therein and having a pair of chains secured at either side of the concavity and having a locking device adjustably securing the chains about the pipe disposed in the concavity.

Keywords: Dredge pipe

U.S. Cl. X.R. 37-72; 114.5F; 248-74R



3,921,407

**OIL SPILL CONTAINING BOOM**

James Henry Neal, 612 - 15 St., N.W., Calgary, Alberta, Canada

Filed June 19, 1973, Ser. No. 371,397

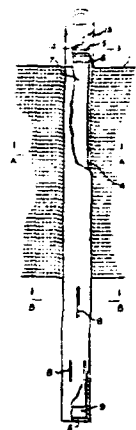
Int. Cl.<sup>3</sup> E02B 15/04

U.S. Cl. 61-1 F

3 Claims

The boom comprises an erect band of oil-containing mesh material attached to spaced, vertical spars. The spars comprise hollow, rigid tubes partially filled with buoyant foamed plastic. Apertures are provided in the wall of the weighted, hollow lower end of each spar to permit water to enter therein and displace the contained air. By virtue of this arrangement, the weighted end of the spar will right it when it is dropped in water. The boom is uniquely light and can be unreeled quickly from a drum for deployment around an oil spill.

Keywords: Pollutant, surface barrier



3,921,408

**ANTI-HEAVE PROTECTIVE SYSTEM**

Jacques Edouard Lamy, Fontenay-aux-Roses, France, assignor to C. G. Doris (Compagnie Generale pour les Developpements Operationnels des Richesses), Paris, France

Continuation-in-part of Ser. No. 324,305, Jan. 17, 1973. This application July 2, 1974, Ser. No. 485,255

Claims priority, application France, Jan. 18, 1972, 72.01560

Int. Cl. E02b 3/06

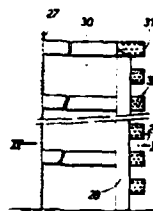
U.S. Cl. 61-3

12 Claims

Anti-heave protective system comprising a bulky wall structure having a closed contour, and a plurality of vertically spaced energy dissipating beams supported by a plurality of posts arranged in closed contour around the wall structure, at a distance sufficient to dip into the water mass moving up and down in front of the wall structure, to slow down and phase-shift the water motions relative to the heave.

Keywords: Breakwater, concrete; Offshore platform, fixed; Offshore storage tank, emergent; Seawall

U.S. Cl. X.R. 61-4; 61-46



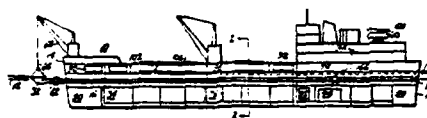
3,922,225  
**SEA-WATER OIL SPILL CLEANING SYSTEM**  
 Patrick J. Strain, 27 Tanglewood Drive, Lynwood, Ottawa,  
 Ontario, Canada  
 Filed Feb. 19, 1974, Ser. No. 443,742  
 Int. Cl.<sup>2</sup> E02B 15/04

U.S. Cl. 210-242

1 Claim

The invention is apparatus for cleaning up oil-spills. It comprises effecting a first separation externally of the ship at the bow, and conveying the oil into the ship for a second separation through an elongated baffled conduit. Oil in excess of the ship's capacity may be discharged at the stern into waiting tankers. Intake means which may heat the oil and include when necessary surrounding wave-damping means connected to the ship's bow communicate flexibly with the ship's interior. One embodiment of the intake means is a wide shallow funnel. Novel for shallow coastal water oil skimming is a floating box having a water-level weir through which oil enters and a discharge port connected to a long flexible conduit communicating with a ship of substantial draft standing off in deep water. Mobile means such as shore tractors and powered boats tied to each box on the land side hold it in position and move it as desired.

Keywords: Pollutant removal watercraft;  
 Pollutant, suction removal



DECEMBER 2, 1975

3,922,739  
**APPARATUS FOR CONVERTING SEA WAVE ENERGY  
 INTO ELECTRICAL ENERGY**  
 Ivan Andreevich Babitsky, Bulvar Yana Rainina, 20, korpus  
 2, kv. 152, Moscow, U.S.S.R.  
 Filed Apr. 18, 1974, Ser. No. 462,090  
 Int. Cl.<sup>2</sup> B63B 21/52

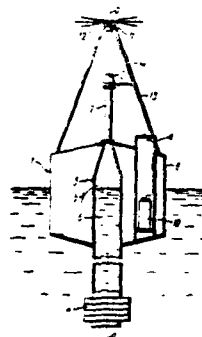
U.S. Cl. 9-8 R

1 Claim

An apparatus for converting sea wave energy into electrical energy, comprising a buoy which executes periodic forced vibrations, with a natural frequency approximating the wave frequency, along the vertical axis of the buoy in a manner that the buoy moves with respect to the wave surface, and a turbogenerator for converting the air flow stream kinetic energy into electrical energy. The buoy is provided with an air chamber and a hydraulic piston, the air chamber communicating through an air duct with the turbogenerator. The latter includes a generator, a turbine stage with a stator and a rotor mounted on the same shaft with the generator. The turbogenerator turbine stage is provided with a supplementary stator disposed downstream of the turbine rotor and made symmetrical with the turbine stage stator with respect to the plane of rotation of the rotor.

Keywords: Buoy, instrumented; Electrical generator; Instrument power supply; Power, wave

U.S. Cl. X.R. 290-42; 290-53



254

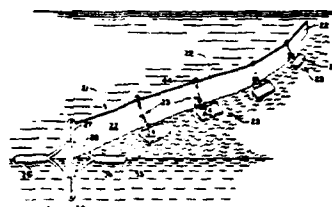
3,922,860  
**FLOATING BOOM HAVING ROTATABLE FLOAT  
 ELEMENTS**  
 Need D. Tanksley, Walnut Creek, Calif., assignor to Pacific  
 Pollution Control, Emeryville, Calif.  
 Filed Sept. 30, 1974, Ser. No. 510,290  
 Int. Cl.<sup>2</sup> E02B 15/04

U.S. Cl. 61-1 F

10 Claims

A floating boom for use in containment and control of floating pollutants, such as oil, is disclosed. The boom includes an elongated sheet-like partition and a plurality of float means mounted to the partition at periodic intervals over the length thereof. The float means include plate-like float elements mounted to the float means for rotation about a horizontal axis to and from a deployed position, for floating support of the boom, and a relatively rotated stored position, which enables a substantial reduction in the bulk of the boom. The float elements are biased by buoyancy and gravity forces to the deployed position, and the partition is formed as a flexible member to enable folding of the boom with the float elements thereon into a compact package. A method of folding the boom for compact storage and rapid deployment is also disclosed.

Keywords: Pollutant, surface barrier



3,922,861  
**FLOATING MARINE BARRAGE**  
 Andre Grihangne, 186, Avenue Victor Hugo, 75016 Paris,  
 France  
 Filed June 19, 1974, Ser. No. 480,868  
 Claims priority, application France, June 21, 1973,  
 73.22756; May 2, 1974, 74.15287  
 Int. Cl.<sup>2</sup> E02B 15/04

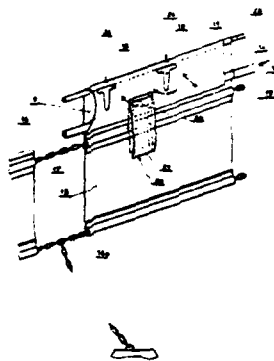
U.S. Cl. 61-1 F

7 Claims

An inflatable marine barrage having an upper buoyancy chamber and lower ballasting based on an inflatable tube of inverted tear drop cross-sections. Means for inflating and venting the tube can be remotely controlled for effecting raising or lowering of the barrage for bringing into use or rendering it inoperative.

Keywords: Pollutant, surface barrier

U.S. Cl. X.R. 114-54



3,922,862  
**FLOATING CONTAINING VESSELS OR DAMS FOR TRAPPING LIQUID POLLUTANTS**  
 Jacques Vidiles, 24 boulevard Maillot, 92000 Neuilly, France  
 Filed July 10, 1974, Ser. No. 487,288  
 Claims priority, application France, Aug. 16, 1973, 73.29908

Int. Cl.<sup>2</sup> E02B 15/04

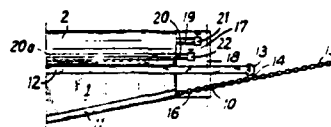
U.S. Cl. 61-1 F

8 Claims

A floating containing vessel or dam for confining slicks of liquid pollutants. The vessel or dam comprises a flexible skirt connected at its upper portion to a float which provides buoyancy to the vessel, and at its lower portion to a ballast. The skirt forms an enclosure wherein the pollutants collect and the depth of the skirt varies from a maximum at the maximum interior position of the enclosure to a minimum at the towing ends of the vessel which define the entrance to the enclosure. The ballast is utilised as a towing means for towing the containing vessel or dam.

Keywords: Pollutant collection; Pollutant, surface barrier

U.S. Cl. X.R. 210-DIG.21



3,922,865  
**MATTRESS, METHOD OF SINKING A MATTRESS AND VESSEL SUITABLE FOR USE IN SAID METHOD**  
 Ate Nijdam, Schelluinen, Netherlands, assignor to Aannemers, Combinatie Zinkwerken B.V., Gorinchem, Netherlands  
 Filed Sept. 10, 1973, Ser. No. 395,575  
 Claims priority, application Netherlands, Oct. 6, 1972, 7213540

Int. Cl.<sup>2</sup> E02B 3/12

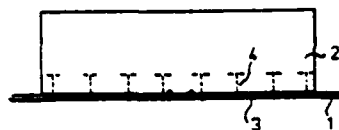
U.S. Cl. 61-38

20 Claims

A mattress is disclosed comprising a filter cloth into which at regular intervals metal bars are woven and spaced concrete blocks are connected to the bars, thus securing the blocks to the filter cloth. In use the space between the blocks may be filled with ballast such as rubble, gravel, etc.

Keywords: Concrete block; Fabric mat; Seabed material placement; Slope protection

U.S. Cl. X.R. 52-388; 61-72.3





3,922,868

# DEEP WATER PLATFORM CONSTRUCTION

Reagan W. McDonald, and Walter B. Joseph, both of Houston, Tex., assignors to Reagan W. McDonald, Houston, Tex.

Filed Aug. 27, 1974, Ser. No. 500,913

Int. Cl.<sup>2</sup> E02D 21/00

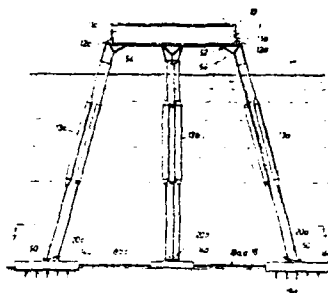
U.S. Cl. 61-46.5

13 Claims

Keywords: Offshore construction; Offshore platform, jack up; Offshore platform, leg

U.S. Cl. X.R. 114-5

A self-erecting offshore platform for deep water installations comprised of three or more (optimum four) leg modules, and one platform module, all of which are buoyant and towable to an offshore site. At a site location the leg modules are pivotally interconnected to the platform and rigged with cables for limiting their relative lateral motion while being pivoted into contact with the ocean floor. The pivoting action is obtained by decreasing the buoyancy of the outer (lower) ends of the leg modules. Upon initial positioning of the leg modules in contact with the ocean floor, they are then lightened by expelling water from their upper buoyancy chambers. The lower ends of the leg modules are drawn toward one another as increased buoyancy in their upper ends raises the platform out of the water. When pre-determined elevation of platform has been reached, the supporting foot pads (mats) are pivotally moved downward to flat contact with the ocean bottom by flooding their upper buoyancy tanks.



3,922,869

# PUMPED EVACUATED TUBE WATER HAMMER PILE DRIVER METHOD

Serge S. Whotsky, Sharon, Mass., assignor to Orb, Inc., Marion, Ohio

Division of Ser. No. 267,741, June 30, 1972, which is a continuation-in-part of Ser. No. 163,422, July 16, 1971. This application July 31, 1974, Ser. No. 493,421

Int. Cl.<sup>2</sup> E02D 7/00

U.S. Cl. 61-53.5

4 Claims

Keywords: Offshore construction; Pile driver, impact

Driving piles with a liquid ram or spear generated in a pumped, evacuated tube. Various configurations are shown, including those in which the pile itself defines at least a portion of the working chamber for generating water hammer, and others in which the working chamber is defined at least in part by tubes other than the pile.



3,923,122

**SEISMIC PNEUMATIC ENERGY SOURCE WITH  
ATTENUATION OF BUBBLE PULSE AMPLITUDE AND  
REDUCTION OF PERIOD OF BUBBLE OSCILLATION**

Oswald A. Itria, Bellaire, Tex., assignor to Texaco Inc., New York, N.Y.

Continuation of Ser. No. 220,940, Jan. 26, 1972, abandoned.

This application Nov. 1, 1973, Ser. No. 411,986

Int. Cl.<sup>2</sup> G01V 1/04, 1/38

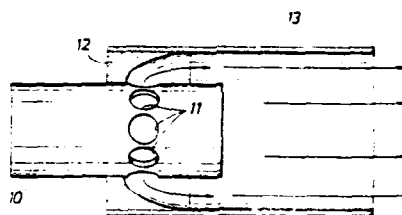
U.S. Cl. 181-115

8 Claims

A method for decreasing the amplitude and period of bubble pulses following a primary seismic energy pulse comprises deflecting all of the expanding gases into the same direction to form the bubble into an elongated shape, and two deflector mechanisms for carrying out this method. A second method comprises generating an expanding air bubble around a body and preventing the air bubble from contracting into the body for attenuating the sudden contraction and collapse of the air bubble, and two valve devices on a closed cylinder for carrying out the latter method resulting in decreased amplitude and period of bubble oscillation for providing a clear, well-defined acoustical wave.

Keywords: Seismic explosive acoustic transmitter

U.S. Cl. X.R. 181-39; 181-120



3,923,661

**OIL SKIMMER WITH LEAD FLOAT AND HINGED WEIR**

Angelo J. Crisafulli, Box 1051, Glendive, Mont. 59330

Filed June 28, 1974, Ser. No. 485,147

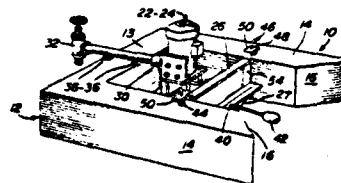
Int. Cl.<sup>2</sup> E02B 15/04

U.S. Cl. 210-242

6 Claims

A two-part skimming device for removing a layer of oil or other floating pollutants from the surface of a body of water, one part being a generally U-shaped flotation or pontoon unit, and the other part being a combined collecting and pumping unit having a hingedly mounted weir plate and a lead float to control the position of the weir plate in relation to the surface of the water. An adjustable mounting for the collecting and pumping unit includes pockets in the flotation unit receiving threaded bolt members which in turn are received in threaded apertures in part of the supporting structure for the weir plate, to aid in varying, in gradual steps, the vertical position of the same, and the lead float is connected to the hinged weir plate and provides "fine" adjustment (response) to variations in wave height.

Keywords: Pollutant removal watercraft; Pollutant, suction removal



3,924,258

# DIGITAL DEPTH SOUNDER

John T. Fowler, Winthrop, Mass., assignor to Arthur D. Little, Inc., Cambridge, Mass.

Filed Mar. 21, 1974, Ser. No. 453,553

Int. Cl.<sup>2</sup> G01S 9/68

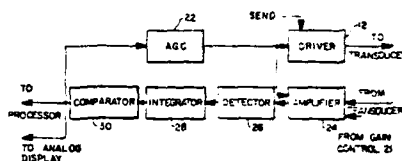
U.S. Cl. 340-3 R

10 Claims

A depth sounder in which a sonic transducer and associated analog circuitry are contained within a common housing and provide serial pulses which are digitally processed for discriminating bottom echoes from spurious echoes. Spurious echo pulses from intermediate objects in the transmission path as well as spurious echo pulses harmonically related to any other echo pulse are discriminated against such that only the last received echo, other than a harmonic, during a sounding interval is displayed to indicate depth.

Keywords: Sonar, depth sounder

U.S. Cl. X.R. 340-1C



DECEMBER 9, 1975

3,924,412

# OIL CONTAINMENT BOOM

John A. Bennett, West Vancouver, and Ian R. McAllister, Vancouver, both of Canada, assignors to Bennett Pollution Controls, Ltd., North Vancouver, Canada

Continuation-in-part of Ser. No. 541,260, Jan. 15, 1975, which is a continuation of Ser. No. 464,539, April 26, 1974,

abandoned. This application Mar. 3, 1975, Ser. No. 554,979

Int. Cl.<sup>2</sup> E02B 15/04

U.S. Cl. 61-1 F

12 Claims

A floating oil containment boom especially adapted to remain continuously in the body of water in which it operates. The boom comprises an elongate, moderately flexible skirt, having an upper edge above the water surface and a lower weighted edge positioned below the water surface. Pairs of floats are mounted to the skirt at regularly spaced intervals along the length of the skirt. In a first embodiment, each float is mounted to the skirt by means of a tongue and groove connecting device, made up of a longitudinal groove in the float and two tongue members connected to the skirt and positioned at opposite ends of the groove of the related float. In a second embodiment the tongue and groove connection is made by a plurality of clips mounted to the skirt and defining a groove to receive upper and lower flanges of the float. Such tongue and groove mountings permit moderate relative longitudinal movement between the connecting portions of the skirt and float so that when the skirt is subjected to moderate elongation under tension loads, there is not undue wear of the connecting portions.

Keywords: Pollutant, surface barrier

No Figure

3,924,413

**FITTINGS AND THE LIKE FOR PIPE PILING**

Richard O. Marsh, Jr., 701 Standard Life Bldg., Pittsburgh, Pa. 15222

Filed Dec. 4, 1973, Ser. No. 421,736

Int. Cl.<sup>2</sup> E02D 5/00, 5/72, F16L 25/00

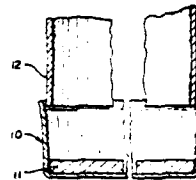
U.S. Cl. 61-53

21 Claims

The specification discloses fittings for attachment of boot plates or otherwise closing the end of pipe piling and for coupling vertically superimposed sections of pipe piling, which fittings are readily and quickly installed and which provide a seal with the pipe to prevent water from entering the interior of the piling, as by seepage, while the piling is in the ground prior to being filled with concrete. One type of fitting is in the form of a shallow pan, on the bottom of which is a boot plate, and the walls of which have a portion smaller in diameter than the outer diameter of the pipe piling so as to expand thereover and provide a metal-to-metal seal with the piling. Variations of this type are disclosed wherein the bottom of the pan is a disc of heavy gauge metal welded to a circular tapered sleeve of relatively thin gauge. Another type of fitting is in the form of a sleeve having an annular groove formed internally midway of its ends in which is disposed a drive ring of relatively heavy metal having O-ring seals on opposite sides thereof. The pipe piling expands the opposite ends of the coupling in moving inwardly into contact with the drive ring and is sealed by engagement with the O-ring seals. A variation of the latter type of fitting is adapted to couple pipe piling of different diameters.

Keywords: Pile-driving shoe; Pile section connection; Pile, steel

U.S. Cl. X.R. 61-93.5; 138-89; 285-345; 403-305



3,924,414

**PILE FOR USE IN OFFSHORE AREAS HAVING A SHIFTING LAYER OF MUD**

George P. Maly, Newport Beach, Calif., and Clifton A. Tannahill, Houston, Tex., assignors to Union Oil Company of California, Brea, Calif.

Filed Aug. 22, 1974, Ser. No. 499,150

Int. Cl.<sup>2</sup> E02D 5/22

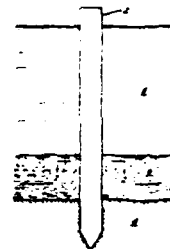
U.S. Cl. 61-53

7 Claims

A pile for use in offshore areas having a shifting layer of mud overlaying a competent bottom. The pile is adapted to be driven through the mud and into the underlying bottom so that its lower end is fixedly imbedded in the competent bottom with the pile extending upwardly through the mud. The pile is provided with means for ejecting fluid at a plurality of locations from the interior of the pile into the mud surrounding the pile. The ejected fluid increases the fluid saturation of the mud adjacent to the pile and thereby reduces the forces exerted on the pile by the shifting mud.

Keywords: Pile protection; Seabed foundation; Seabed soil treatment

U.S. Cl. X.R. 61-53.74



3,924,896  
**AIR CUSHION DREDGE FOR USE IN ICE-COVERED  
WATERS**

Owen D. Blankenship, Houston, Tex., assignor to Global Marine Inc., Los Angeles, Calif.

Division of Ser. No. 276,110, July 28, 1972, Pat. No. 3,822,558. This application Apr. 22, 1974, Ser. No. 462,749  
Int. Cl.<sup>2</sup> E02F 3/88

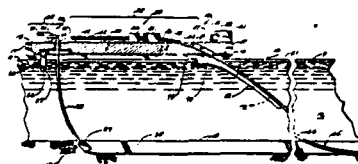
U.S. Cl. 299-18

6 Claims

Keywords: Dredge, cutterhead; Dredge propulsion; Ice protection

U.S. Cl. X.R. 37-58; 37-65; 37-195; 61-72.4; 114-42; 180-127; 299-25

Apparatus for arctic dredging and marine pipelaying during ice-free and iced conditions is described. For dredging, a dredging facility is carried on a buoyant platform which is adapted for support on a cushion of air. The dredging facility includes a dredging head which is operable, when engaged with the bed of a body of water to be dredged, for removing material from the bed. A dredgings conductor tube is connectible between the dredging head and the platform for conducting dredged material from the head to the platform. The dredging equipment also includes means carried by the platform for forming a channel through a layer of ice below the platform for passage of the conductor tube through the ice when the dredging apparatus is operated during iced conditions.



DECEMBER 16, 1975

3,925,991  
**FLOATING OIL FENCE**

John M. Poche, 6317 Franklin Ave., New Orleans, La. 70122  
Filed July 24, 1974, Ser. No. 491,522

Int. Cl.<sup>2</sup> E02B 15/04

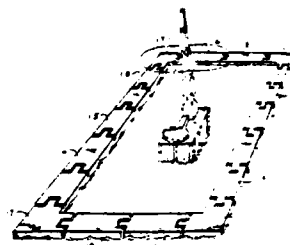
U.S. Cl. 61-1 F

12 Claims

Keywords: Pollutant, surface barrier

U.S. Cl. X.R. 114-.5F; 210-DIG.21

This invention consists of a plurality of floating interlocking pontoons that are connected together to form a floating oil fence around spilled oil in harbors, lakes, rivers, gulfs, deep seas, or any other bodies of water. The interlocking sealed couplings permit lateral, longitudinal, vertical, and horizontal movement of each pontoon in such a manner that the oil within the confines of the fence will not seep out between the coupled pontoons. Oil contained within the aforesaid fence may be pumped into the interlocked pontoons for storage or transported after being picked up by larger vessels.



3,925,997

# **BREAKWATER DEVICE FOR OFFSHORE SUBMERGED FOUNDATION STRUCTURES**

Petter Sigvardt Halskjold, Bekkestua, Norway, assignor to Ingenior F. Selmer A/S, Oslo, Norway  
Division of Ser. No. 369,694, June 13, 1973. This application Aug. 28, 1974, Ser. No. 501,402

Claims priority, application Norway, June 13, 1972, 2083/72

Int. Cl.<sup>1</sup> E02D 27/38; E02B 3/04

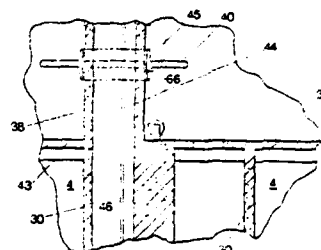
U.S. Cl. 61-46.5

3 Claims

A submarine foundation and offshore working platform comprising a submersible integral concrete structure adapted to be situated on the sea bottom and having hollow spaces for confining ballast, oil, water etc. Said structure comprises a plurality of vertically arranged cylindrically shaped lower hollow bodies bound together in the contacting areas, and on the overside of said bodies a plurality of platform supporting columns extending above sea level and carrying a platform structure. The columns are provided with breakwater means which comprises a disk-shaped structure slidably mounted thereon.

Keywords: Offshore platform, fixed; Offshore platform, leg; Offshore structure fender; Pile protection

U.S. Cl. X.R. 61-1; 61-5; 61-50



3,926,003

# **BOUYANCY AND ATTITUDE CORRECTION METHOD AND APPARATUS**

Robert M. Norman, Route #1, Lafayette, La. 70501  
Division of Ser. No. 175,448, Aug. 27, 1971. This application Oct. 25, 1973, Ser. No. 409,601

Int. Cl. E02F 5/02; F16I 1/00; B63B 35/42

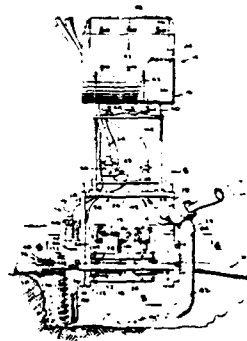
U.S. Cl. 61-72.4

10 Claims

An underwater self-propelled buoyant trenching apparatus for burying a pipeline or cable on the bottom of a body of water having cutting means on a frame to cut the trench. The apparatus is self-propelled along the pipeline. Buoyant outrigger compartments on each side of the pipeline to adjust the attitude of the apparatus over the pipeline. Each compartment is open at the bottom to the water and is provided also at the bottom with a gaseous inlet and at the top with a gaseous outlet to control the level of the water in each compartment.

Keywords: Seabed pipeline placement; Seabed trencher

U.S. Cl. X.R. 61-46.5; 114-.5F



3,926,056

# CONDUCTIVITY, TEMPERATURE AND PRESSURE MEASURING SYSTEM

Neil L. Brown, Falmouth, Mass., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Sept. 26, 1974, Ser. No. 509,508

Int. Cl.<sup>3</sup> G01L 9/04

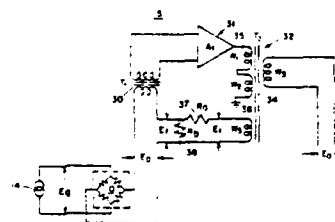
U.S. Cl. 73-398 AR

5 Claims

A profiler for measuring ocean conductivity, temperature and depth employs A.C. excited sensors with the ratio of each output signal to the input signal being indicative of the parameter being measured. Each sensor has an interface circuit which amplifies the output signal to a level sufficient to permit its transformation to a 16-bit signal by an analog-to-digital converter having a quadrature balancing provision that cancels the signal component caused by the A.C. excitation. The digital signals in frequency shift form are sent to the surface for processing.

Keywords: Bathythermograph; Depth pressure measurement; Salinity measurement

U.S. Cl. X.R. 73-345; 324-57R; 324-99D; 324-DIG.1



3,926,137

# DEEP OCEAN PARACHUTE RELEASE

Norman F. Johnson, San Diego, Calif., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Mar. 3, 1975, Ser. No. 555,012

Int. Cl.<sup>2</sup> B63B 21/48

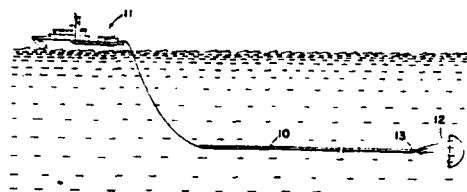
U.S. Cl. 114-209

6 Claims

A drogue chute is used to extend a long line transducer array in the water as it is being towed in or played out in an ocean current. To avoid problems during a subsequent retrieval of the array, the drogue chute is disconnected. For this reason a release mechanism is interposed between the transducer array and the chute. This release mechanism provides for a nonabrupt separation of the array from the chute's riser straps. An electronic circuit in the mechanism initiates the separation of a first riser strap to dump the entrained water and next, the second riser to completely sever the chute from the array.

Keywords: Instrument retrieval; Seismic streamer cable

U.S. Cl. X.R. 83-39; 114-235B; 244-151B; 307-252N; 307-252J; 340-3T



3,926,812

# FLOATAGE CONCENTRATING EQUIPMENT FOR NAUTICAL FLOATAGE RECOVERY APPARATUS

Robert W. Neal, Watertown, Mass., assignor to JBF Scientific Corporation, Burlington, Mass.

Filed Sept. 3, 1974, Ser. No. 502,393

Int. Cl.<sup>2</sup> E02B 15/04

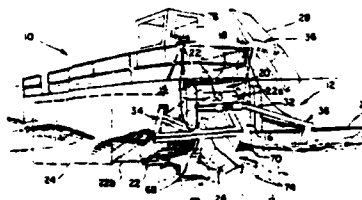
U.S. Cl. 210-242

9 Claims

A nautical vessel for recovering floatage entrained at a bow opening deploys boom-mounted floatage-concentrating sweeps arranged to enter the bow opening, without collision with the hull, when undergoing motion due to heavy seas. Sealing barriers are affixed to the hull and in sliding engagement with each sweep to prevent leakage of sweep-engaged floatage at each sweep-vessel juncture.

Keywords: Pollutant collection; Pollutant removal watercraft; Pollutant, surface barrier

U.S. Cl. X.R. 210-DIG.21



3,927,330

**WATER POWER MACHINE AND UNDER SEA, UNDER  
WATER GENERATOR STATION**

Roy E. Skorupinski, 6402 Jim, Houston, Tex. 77018  
Filed Apr. 29, 1974, Ser. No. 464,961  
Int. Cl.<sup>2</sup> F03B 13/00; E02B 9/08

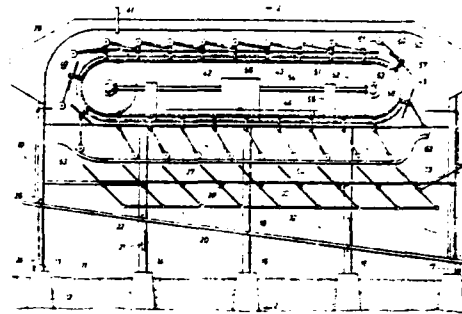
U.S. Cl. 290-54

20 Claims

This apparatus relates to a device which converts water flow into electrical power. It is particularly adapted to be installed totally submerged in a body of water or at offshore locations. It intercepts tidal flow, oceanic currents and the like to generate power. It includes a framework enabling the apparatus to be installed on the bottom of a body of water. It incorporates a plurality of adjustable guide louvers which are positioned to direct a stream in a particular manner. The louvers cooperate with a generally flat transverse plate which extends fully across the equipment. The plate cooperates with the louvers to direct the stream of water to a point intercepting the set of buckets carried on a conveyor. The buckets are not of ordinary construction as found on water wheels, but are especially constructed to erect when intercepting water flow, which causes them to fill, and to collapse on a return passage. They are mounted on a conveyor belt which travels in endless fashion. The collapsing of the buckets on the return passage reduces water flow resistance and forces them to dump the water. The buckets are defined by transverse pivotable plates which have guide wheels which engage a set of guide rails at the outer end.

Keywords: Electrical generator; Power, submerged source; Power, tide; Seabed foundation

U.S. Cl. X.R. 415-5



DECEMBER 23, 1975

3,927,533

**UNDERWATER WALL STRUCTURE**

Robert Newman Hebel, Jr., 5306 Bowling Green Drive, Fort  
Pierce, Fla. 33450  
Filed Aug. 13, 1974, Ser. No. 496,935  
Int. Cl.<sup>2</sup> E02B 3/04

U.S. Cl. 61-4

7 Claims

A permanent underwater wall structure comprising a series of individual pilings driven into the ocean floor, serves in the process of shoreline accretion. The underwater wall structure consists of three portions. These are: two end portions extending from the shoreline to an offshore bar, and a connecting middle portion running generally along the length of the offshore bar and connecting the two middle portions. The individual pilings are driven into the ocean floor at such a depth that all except the pilings closest to the fore-shore are beneath the waterline and are at the same height approximating the level of the top of the offshore bar. The underwater wall structure serves, then, to allow unimpeded flow of water toward the shore, but impedes the offshore and littoral currents laden with sediment so as to allow deposition of sediment within the area defined by the wall structure.

Keywords: Bar protection; Breakwater, concrete; Groin; Pile, concrete; Pile, sheet

U.S. Cl. X.R. 61-53.74; 61-59





3,927,535

**JACK-UP TYPE OFFSHORE OIL PRODUCTION  
PLATFORM APPARATUS AND METHOD**

Robert P. Giblon, Shrewsbury, N.J., assignor to George G. Sharp, Inc., New York, N.Y.

Continuation-in-part of Ser. No. 287,256, Sept. 8, 1972, Pat. No. 3,797,256. This application Mar. 18, 1974, Ser. No.

452,465

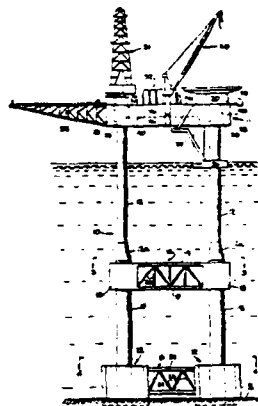
Int. Cl.<sup>2</sup> E02B 17/00; B63B 35/44

U.S. Cl. 61—46.5

22 Claims

Jack-up type offshore platform apparatus particularly adapted for assembly and partial erecting, then towing to an offshore site in fully outfitted and loaded condition, and subsequent installation and use as a substantially permanent oilwell drilling and production platform in water depths of 500 feet or more. Apparatus has one or more lower support platform structures, each having attached upwardly projecting support legs for supporting the platform structure thereabove. Downwardly projecting lower legs have "pads" which rest on, but are not pinned to the sea bottom. In a preferred embodiment a bottom platform structure provides a "mat" which rests on sea bottom. Method involves assembly and partial erecting of apparatus with lower legs and lower platform structures fully extended below, and submerged beneath the then floating upper platform before and during towing to oil-field site. At the site the apparatus is self-erecting.

Keywords: Offshore construction; Offshore platform, jack up; Offshore platform, leg; Seabed foundation



3,927,562

**ENVIRONMENTAL PROFILER**

George F. Hickey, Jr., Oxon Hill, Md., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Nov. 4, 1974, Ser. No. 520,818

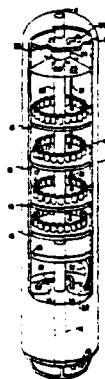
Int. Cl.<sup>2</sup> G01W 1/00

U.S. Cl. 73—170 A

5 Claims

An environmental profiler and method for use in water to measure the different parameters of the water along a vertical line from 3000 feet to the surface or any other desired depth. The device includes 64 individual gas generators each of which are sufficient to raise the device at a rate of 1.5 ft/sec. The device is programmed to vent the excess gas and to be lowered to the bottom after each trip until all gas generators have been activated. The sampling is made during descent and ascent and while at bottom and top, with the sampling information recorded digitally by instrumentation carried by the profiler.

Keywords: Buoy mooring system; Instrument deployment; Instrument retrieval



3,927,722

**PILE DRIVING MOVING CYLINDER HAMMER WITH VALVED, FIXED PISTON**

Leonard L. Frederick, 15 Crestview Terrace, Whippany, N.J. 07981

Filed Feb. 8, 1974, Ser. No. 440,861

Int. Cl.<sup>7</sup> E02D 7/10

U.S. Cl. 173—125

21 Claims

What follows is a description of a unique hammer for driving pile members onshore or offshore, an apparatus for driving pile members offshore, and a method of driving a pile member.

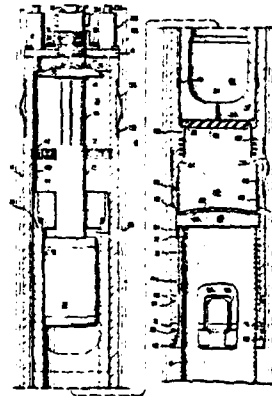
The hammer includes a displaceable ram structure which is reciprocated by a pressurized working fluid against a pile member-engaging anvil structure. The anvil structure is preloaded by a quantity of fluid compressed by the ram structure in the course of its impact delivering displacement. This preload causes the anvil structure to also be displaced in the impact delivering direction, but at a lower rate than the ram structure.

The method provides for directing pressurized working fluid in a first direction to load a ram structure, directing a portion of this pressurized working fluid further in the first direction in order to decelerate the movements of the ram structure in the loading direction, to direct another portion of the pressurized working fluid in a second direction for producing a firing of the ram structure, and to preload an anvil structure utilizing the firing mode of the ram structure in order to cause the anvil structure to be displaced in the firing direction, but at a slower rate than the ram structure.

For driving a pile member from an offshore installation, a conduit structure is provided into which the pile member, the hammer and a supporting structure for the hammer are inserted and displaced in the course of driving the pile member. In addition to the method mentioned above, when driving a pile member from an offshore installation, the water immediately surrounding the area at which the anvil structure engages the pile member, is displaced.

Keywords: Offshore construction; Pile driver, impact

U.S. Cl. X.R. 61-53.5; 91-2168; 91-224; 173-131



3,928,205

**REMOVAL OF FLOATING POLLUTANTS**

Errol V. Seymour, and Ray R. Ayers, both of Houston, Tex., assigns to Shell Oil Company, Houston, Tex.

Continuation of Ser. No. 367,037, June 4, 1973, abandoned, which is a continuation of Ser. No. 147,934, May 28, 1971, abandoned. This application May 17, 1974, Ser. No. 470,888

Int. Cl.<sup>7</sup> E02B 15/04

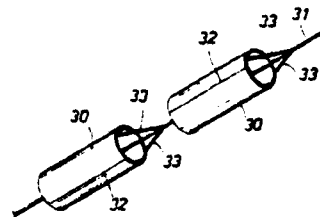
U.S. Cl. 210—242

1 Claim

Apparatus and method for removing a-polluting liquid from a water surface, the apparatus being composed of discrete sorbent bodies connected by a tension member and positioned along the water surface in contact with the floating pollutant; the method involving positioning connected discrete sorbent bodies in contact with a floating pollutant, sorbing the pollutant, continuously recovering the sorbent, removing the pollutant from the sorbent, and returning the sorbent to contact with the pollutant on the water surface.

Keywords: Pollutant absorption; Pollutant, mechanical removal

U.S. Cl. X.R. 210-DIG.21



3,928,206

**APPARATUS FOR THE COLLECTION OF BUOYANT  
FOREIGN MATTER**

Frank Arthur Oakley Warren, 301 A Kingsway, Hove, Sussex,  
England

Continuation-in-part of Ser. No. 217,058, Jan. 11, 1972,  
abandoned. This application July 18, 1974, Ser. No. 489,811

Claims priority, application United Kingdom, Jan. 21, 1971,  
2398/71 The portion of the term of this patent subsequent to  
Aug. 8, 1989, has been disclaimed.

Int. Cl.<sup>2</sup> E02B 15/04

U.S. Cl. 210—242

23 Claims

Apparatus for collection oil and/or debris floating on or near the surface of a body of water includes a collecting tank supported to float in water with its upper edge above water level, the tank having side walls, a rear wall and an open bottom. Water and any oil or debris present is caused to flow into the tank by means of a vaned impeller extending between the side walls of the tank and arranged for rotation about a horizontal axis positioned somewhat above water level. The oil and debris collected in the tank is retained therein by a non-return valve consisting of a plate which extends between the side walls of the tank rearwardly of the impeller and is pivotally mounted at its lower edge for rearward movement about an axis positioned below water level. The upper edge of the plate is provided with a float so as normally to maintain this edge above water level.

Keywords: Pollutant debris; Pollutant,  
mechanical removal; Pollutant  
removal watercraft

U.S. Cl. X.R. 210-DIG.21

No Figure

DECEMBER 30, 1975

3,928,967

**APPARATUS AND METHOD FOR EXTRACTING WAVE  
ENERGY**

Stephen Hugh Salter, 143 E. Trinity Road, Edinburgh, EH53  
PP, Scotland

Filed Nov. 6, 1974, Ser. No. 521,385

Claims priority, application United Kingdom, Nov. 15, 1973,  
53119/73; May 6, 1974, 19763/74

Int. Cl.<sup>2</sup> F01D 25/00; F03G 7/00; F04B 35/00

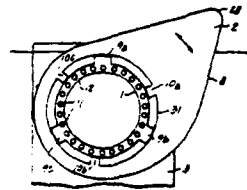
U.S. Cl. 60—398

18 Claims

Apparatus and method for extracting the tremendous energy from a wave pattern as for example on the surface of a body of water which comprises a plurality of movable members so shaped that the surface of the member which engages the incoming wave causes the member to rotate about a substantially horizontal axis and remove energy from the wave and wherein the rear portion of the movable member is constructed so as to move with minimum energy transfer between the movable member and the fluid. The energy extracted by the movable member is converted into a hydraulic, electrical, mechanical, or chemical energy so as to allow the wave energy to be directly converted into useable form.

Keywords: Electrical generator; Power, wave;  
Pump

U.S. Cl. X.R. 60-495; 415-7; 417-332



3,928,978

**APPARATUS FOR PRODUCING AND PROTECTING DEPOSITS OF SEDIMENTARY MATERIAL ON FLOORS OF BODIES OF WATER**

Ole Jeppe Fjord Larsen, Fasanvaenget 62, 6733 Hjerding, Denmark

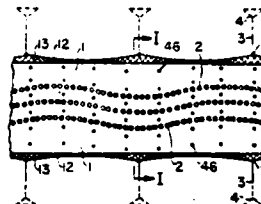
Division of Ser. No. 212,056, Dec. 27, 1971, Pat. No. 3,844,123. This application Oct. 25, 1974, Ser. No. 518,050  
Int. Cl.<sup>2</sup> L02B 3/04

U.S. Cl. 61-3

3 Claims

This disclosure relates to apparatus for producing and protecting deposits of sedimentary material on a floor of a body of water, the apparatus including a flexible sheet located beneath the surface of the water in at least partially upwardly spaced relationship, close to, but above the floor, and means for maintaining the flexible sheet so positioned.

Keywords: Bar protection; Fabric mat; Seabed scour protection



3,928,982

**METHOD AND DEVICE FOR A FOUNDATION BY DEPRESSION IN AN AQUATIC SITE**

Roger Lacroix, Sceaux, France, assignor to Sea Tank Co., Paris, France

Filed Mar. 5, 1974, Ser. No. 448,436

Claims priority, application France, Mar. 5, 1973, 73.07739  
Int. Cl.<sup>2</sup> E02D 27/52

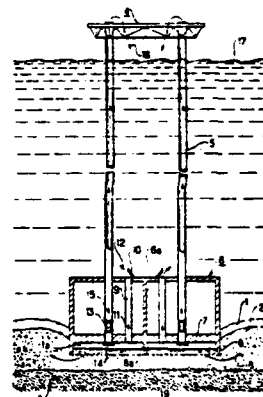
U.S. Cl. 61-50

4 Claims

Method and device for a foundation by depression in an aquatic site in connection with a structure comprising a tank with an apron provided with ridges digging into the ground and passing through a permeable sandy surface layer resting on an impermeable clay layer, characterized in that the ridges, arranged continuously at the periphery of the apron, enclose the said sandy layer in a confined space comprised between the said apron and the said clay layer and in that the suction of the trapped water sets up a depression ensuring the continuation of the sinking of the said tank.

Keywords: Offshore construction; Offshore storage tank, submerged; Seabed foundation; Seabed soil treatment

U.S. Cl. X.R. 61-46.5



3,929,015

**LINE MOTION AND WATER CURRENT DISC SENSOR**

Michael L. Greene, Oxon Hill, and George J. Moss, Bethesda, both of Md., assignors to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Apr. 30, 1975, Ser. No. 573,278

Int. Cl.<sup>2</sup> G01F 1/28

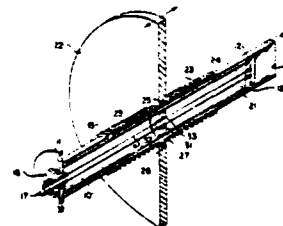
U.S. Cl. 73-170 A

4 Claims

An instrument for determining velocity of ocean currents and/or frequency and amplitude of strumming mooring lines. A magnetic controlled contact relative to resistance wires controlled by a spring loaded disc operates as a potentiometer to indicate the intended result.

Keywords: Current measurement

U.S. Cl. X.R. 73-228



261

3,929,631

**COMPOSITIONS AND SYSTEMS TO RECOVER OILS  
FROM AQUEOUS AND SOLID SURFACES**

Aniela Winkler, 120 Wilson Drive, Hazleton, Pa. 18201  
Continuation of Ser. No. 725,529, April 30, 1968, abandoned.  
This application July 6, 1971, Ser. No. 160,204  
Int. Cl.<sup>1</sup> C02B 9/02

U.S. Cl. 210—36

7 Claims

Compositions and systems capable to effectively coagulate and recover oils from aqueous and solid surfaces, by application thereon of particulate expanded polystyrene and polystyrene-butadiene, said particles combined with meltable hydrocarbons such as paraffin, naphthalene, and mixtures thereof.

Keywords: Pollutant absorption

U.S. Cl. X.R. 210-40; 210-DIG.21

No Figure

3,929,644

**WATERCRAFT FOR SCAVENGING OIL SPILLAGE**

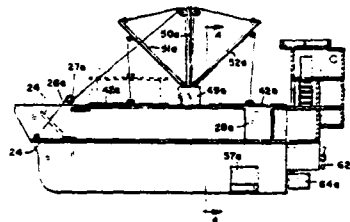
George M. Fletcher, 456 Lee St., Oakland, Calif. 94610  
Filed Dec. 28, 1970, Ser. No. 101,964  
Int. Cl.<sup>1</sup> E02B 15/04

U.S. Cl. 210—242

5 Claims

A self-propelled watercraft for scavenging oil spillage and other floating debris from the surface of a body of water as, for example, oil accumulations and other debris that floats about harbor areas. The watercraft has a catamaran-type hull providing spaced apart hull sections each of which is equipped with a receiving tank having a substantial volume thereof extending downwardly below the surface of the water body. Each tank has an inlet located along and above a generally horizontal deck extending between the hull sections at the water level, and each tank also has an exit opening adjacent the bottom thereof which places it below the deck. The craft is open at its bow to define a mouth which permits a surface layer of the body of water to wash rearwardly along the deck toward the inlet opening of each tank as the craft is propelled through the water. Since the oil spillage and other debris is lighter than water and therefore floats, the volume of each receiving tank is effectively increased by removing the water accumulations that settle toward the bottom of the tank; and such removal of water is effected by reducing the pressure at the exit openings via a venturi flow passage system associated with the exit openings and which reduces the pressure thereat automatically as the craft moves through the water.

Keywords: Pollutant collection; Pollutant removal watercraft



3,930,168

WAVE-ACTION POWER APPARATUS

Michael G. Tornabene, 462 - 7th Ave., New York, N.Y. 10018  
Continuation-in-part of Ser. No. 428,349, Dec. 26, 1973, and  
a continuation-in-part of Ser. No. 432,211, Jan. 10, 1974. This  
application Apr. 1, 1974, Ser. No. 457,075  
Int. Cl.<sup>7</sup> F03B 13/10

U.S. Cl. 290-53

22 Claims

Keywords: Offshore platform, fixed; Power,  
wave; Pump

U.S. Cl. X.R. 417-331

In a preferred embodiment of the invention, there is provided a double-action piston water pump of elongated shape with the piston supported on a lever rod extending coaxially to the piston chamber and extending through both ends of the cylinder providing thereby equal volume displacement constantly throughout the cylinder inner space irrespective of the position of the piston during the to and fro strokes, with there being mounted on a lower end of the lever rod a float element revoluble around the lever rod with the lever rod as a central axis thereto and with there being detachably mounted on the float element an additional dense mass for varying the depth that the float element sits in the water and varying momentum and inertia during a stroke, the float element including separable and dismountable upper and lower halves and including bearing mountings of the upper and lower halves with a lubrication port and channel for pressurized lubrication of the bearing mountings, and there also being included in closed flow cycle inlet and outlet conduits to and from the opposite ends of the piston cylinder with appropriate one-way valves therein and mounted within the conduit cycle there being a turbine propelled by the pumped fluid such as pumped water, the cylinder and the conduits and the turbine being arranged relative to one-another to obtain a substantially unbroken circle of flow for accentuating fly-wheel-like inertia and momentum of the circularly flowing water, there also being an additional mass body mounted on a lower end of the lever rod having a stabilizing effect against distorting torques on the lever rod, the revolving float element also reducing any such distorting torque effects also, the rod lever being slidably supported by two bearing mountings located both above the upper extremity of the upward stroke of the lever rod responsive to the crest of a wave pushing upwardly on the float element.



3. 1976

3,930,373 to 3,999,566

JANUARY 6, 1976

3,930,373

**REINFORCED CONCRETE PILE AND A METHOD OF  
MANUFACTURING SUCH A PILE**

Lorentz Walmann, Goteborg, Sweden, assignor to Roy Asser-  
back, Marbella, Spain

Division of Ser. No. 471,899, May 21, 1974. This application  
Mar. 3, 1975, Ser. No. 554,704

Claims priority, application Sweden, May 21, 1973,  
7307092

Int. Cl.<sup>2</sup> E02D 5/30; E04B 1/48

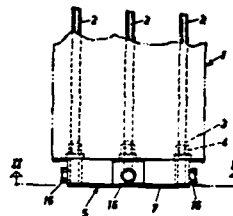
U.S. Cl. 61-56

1 Claim

In a concrete pile the axially running bars of the rein-  
forcing structure are attached to an end collar of the  
pile by threaded connectors screwed into the collar  
and each enclosing the threaded end of a reinforcing  
bar.

Keywords: Pile, concrete

U.S. Cl. X.R. 52-726; 61-53; 403-316



3,931,608

**CABLE DEPTH CONTROL APPARATUS**

Jimmy R. Cole, Houston, Tex., assignor to Syntrol, Inc., Hous-  
ton, Tex.

Filed Apr. 25, 1974, Ser. No. 463,980

Int. Cl.<sup>2</sup> G01V 1/28

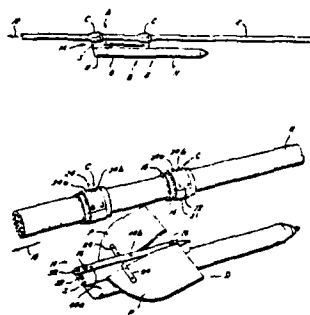
U.S. Cl. 340-7 PC

12 Claims

An apparatus to control the depth in the water of a ca-  
ble, such as a cable streamer of seismic geophones or  
hydrophones towed behind an exploration boat during  
seismic surveys of submerged formations, and main-  
tain the cable at a desired depth while operating at re-  
duced noise levels and with improved operating char-  
acteristics. The depth at which the cable is maintained  
may be adjusted for a range of selected depths.

Keywords: Seismic streamer cable; Towed body  
depth control

U.S. Cl. X.R. 114-235B; 340-3T



JANUARY 13, 1976

3,931,716

**PILE SPLICE FOR CONCRETE AND STEEL PILES OF  
VARIOUS CONFIGURATION**

Donald Payne, 53 O. K. Ave., Harahan, La. 70123

Filed June 7, 1974, Ser. No. 477,278

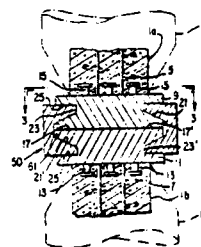
Int. Cl.<sup>2</sup> E02D 5/34, 5/22

U.S. Cl. 61-53

19 Claims

A pile splice is disclosed which completely satisfies the need for such a device which will enable structural analysis of the loads and stresses induced therein, which is simple and economical; which may be readily completed in the field with a minimum of construction equipment and comprises a pair of mating plates having machined abutting surfaces, one each carried by the pile section and embodying an outwardly projecting flange circumscribing the joint area. A tension band is applied to the flanges being comprised of two halves which are joined together at diametrically opposed points by upper and lower fillet welds so that the only stress in the bands is hoop stress induced by tension or bending and shear and the mating plates act in compression as a solid joint whereby all of the loads and resulting stresses in the joint section may be calculated by accepted stress-strain calculations.

Keywords: Pile, concrete; Pile section connection; Pile, steel



3,931,740

**APPARATUS FOR COLLECTING SURFACE PARTICLE  
ON BODY OF WATER**

Lyle Carter, 1903 33rd Ave., Oakland, Calif. 94601

Continuation-in-part of Ser. No. 302,215, Oct. 30, 1972, Pat.

No. 3,811,325. This application Feb. 6, 1974, Ser. No.

440,171. The portion of the term of this patent subsequent to May 21, 1991, has been disclaimed.

Int. Cl.<sup>2</sup> G01N 1/12

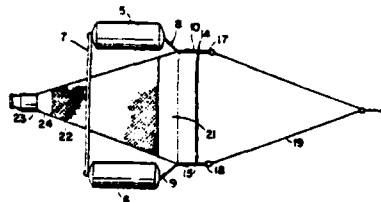
U.S. Cl. 73-425.4 R

19 Claims

An apparatus for sampling and collecting floating particulate matter on the surface of a body of water has parallel, laterally-spaced, longitudinal tracking floats supporting a rigid tubular frame. Secured to the frame are two parallel, horizontal hydrofoil bodies spaced apart from each other to form an intake opening. A funnel-shaped net with its wide end secured to the intake opening and its narrow end terminating in a collecting screen collects surface particulate matter which is caused to flow into the intake opening as the apparatus is towed on a body of water. The lower hydrofoil body maintains the intake opening at a predetermined depth below the water surface, while the upper hydrofoil body enables the apparatus to ride over swells. In an alternative embodiment, a canvas sail is disposed above said net to form an air capturing pouch which provides a lifting force to lift and maintain the net in an attitude generally parallel to the water surface. This attitude maintenance permits the skimming of a relatively thin layer of surface water and floating matter from the bulk water below.

Keywords: Instrument deployment; Pollutant collection; Sampler, surface

U.S. Cl. X.R. 210-242





3,932,834  
SEISMIC TRANSDUCER ASSEMBLY FOR MARSHY  
TERRAINS

Byron C. Sutherland, Pearland, Tex., assignor to Walker-Hall-  
Sears, Inc., Houston, Tex.

Filed Oct. 23, 1973, Ser. No. 408,772

Int. Cl. G01v 1/16

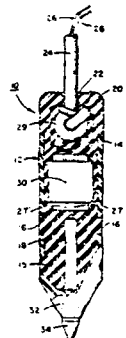
U.S. Cl. 340-7 R

3 Claims

This invention relates to seismic transducer assemblies for converting compressional wave motion or acoustic energy into electric energy in a fluid medium such as is encountered in marshy terrains. It also relates to an improved method of manufacturing such transducers. The transducer includes a rigid hollow casing having a conical end cap to facilitate planting the casing into the ground. At least one pressure transducer element is mounted in the casing. A water-impervious, pressure-transmitting, insulating core fills the casing's cavity. The material rigidly holds the transducer in place and allows transfer of pressure energy from the fluid medium in which the transducer assembly is submerged, to the inner surfaces of the transducer element.

Keywords: Seismic hydrophone

U.S. Cl. X.R. 181-122; 340-8R



3,932,835  
TOWABLE VLF SONAR PROJECTOR  
Frank R. Abbott, San Diego, Calif., assignor to The United  
States of America as represented by the Secretary of the  
Navy, Washington, D.C.

Filed Sept. 25, 1974, Ser. No. 508,925

Int. Cl. H04R 1/44

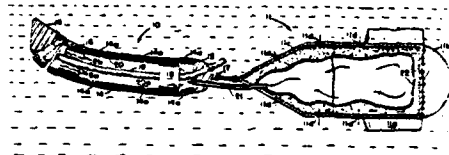
U.S. Cl. 340-7 R

4 Claims

An improved line array transducer increases its effectiveness by ensuring a more responsive trailing as it is towed through the water. An elongate sleeve contains a number of longitudinally spaced transducer elements which are responsive for the transmission or reception of acoustic energy. An interconnected, flexible bladder carried inside of a towing is coupled to the elongate sleeve. As the paravane leads the line array to its predetermined operational depth, the more compliant bladder yields to the pressure and is compressed. This compression of the bladder forces a contained gas into the interior of the elongate sleeve and the transducer's interiors to pressure compensate the array. By suitably choosing the materials and appropriately dimensioning the bladder, sleeve and transducer elements, an essentially neutrally buoyant line array is fabricated for deployment at the predetermined operational depth. Such an array trails responsively and does not generate excessive flow noise.

Keywords: Seismic acoustic transmitter  
array; Seismic streamer cable;  
Seismic vibratory acoustic  
transmitter; Towed body depth  
control

U.S. Cl. X.R. 340-8PC; 340-9



273

JANUARY 20, 1976

3,932,999

PILE DRIVING

George Stewart Todd, Thames Ditton, England, assignor to  
Taylor Woodrow International Ltd., London, England  
Filed Nov. 15, 1974, Ser. No. 524,276  
Claims priority, application United Kingdom, Nov. 16, 1973,  
53425/73

Int. Cl.<sup>2</sup> E02D 7/00

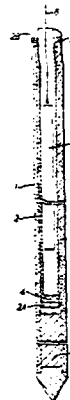
U.S. Cl. 61—53.5

6 Claims

Driving hollow piles by utilising a hollow drive tube  
inserted in the tube and applying hammer blows to an  
abutment at the bottom of this tube.

Keywords: Pile driver, impact

U.S. Cl. X.R. 173-139



3,933,042

WATER LEVEL GAUGE

Norwood H. Rector, and Rodney G. Fredericks, both of Baton  
Rouge, La., assignors to The United States of America as  
represented by the Secretary of the Navy, Washington, D.C.  
Filed Apr. 5, 1974, Ser. No. 458,156  
Int. Cl.<sup>2</sup> G01F 23/26

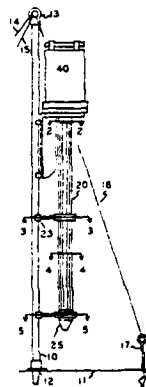
U.S. Cl. 73—304 C

9 Claims

The invention disclosed in the specification is directed  
towards an improved device for measuring liquid lev-  
els and specifically provides a pair of capacitance  
probes, one of which is coated with a dielectric mate-  
rial, positioned in a stilling well which is coupled to a  
conical housing for an entrance orifice to provide con-  
trolled level changes; and, in addition is provided with  
electronic circuitry and recording equipment and  
power pack

Keywords: Tide measurement; Wave measurement

U.S. Cl. X.R. 73-304R



3,933,111

# DOCK BUMPER UNIT

Robert J. von Bose, Arlington, and Darrell D. Dial, Fort Worth, both of Tex., assignors to Oil States Rubber Company, Arlington, Tex.

Filed Mar. 22, 1974, Ser. No. 453,853

Int. Cl.<sup>2</sup> B63B 59/02

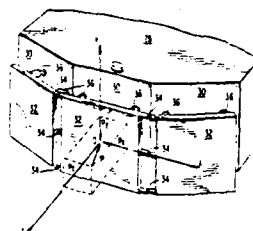
U.S. Cl. 114-219

12 Claims

A method and apparatus is provided for dissipating the energy of random dynamic forces exerted against a pier. The dynamic forces are received by a bumper connected to the side of a pier. The normal components of the forces exerted against the bumper are cushioned and the energy of these forces dissipated by means of reactive forces developed incident to compression of a plurality of compressible, self-restoring cushions connecting and extending orthogonally between the bumper and the pier. Lateral displacement of the bumper relative to the pier in response to components of the dynamic forces acting parallel to the bumper is rigidly restrained by restraining members connecting the bumper and the pier. Once the normal components of the dynamic forces are dissipated, the cushions restore themselves to uncompressed, fully extended conditions and the fender is prepared to receive subsequent loads.

Keywords: Pier fender

U.S. Cl. X.R. 61-43



3,933,632

# REMOVAL OF IMMISCIBLE FLUIDS FROM WATER SURFACES AND LAKE BEDS

Earl C. Peterson, Minneapolis, Minn., assignor to Electrolysis Pollution Control Inc., Minneapolis, Minn.

Continuation-in-part of Ser. No. 362,317, May 21, 1973, abandoned, which is a continuation-in-part of Ser. No.

296,789, Oct. 12, 1972, abandoned, which is a continuation-in-part of Ser. No. 143,713, May 26, 1971, abandoned. This application June 7, 1974, Ser. No. 477,276

Int. Cl.<sup>2</sup> C02B 9/02

U.S. Cl. 210-36

5 Claims

A method of removing immiscible fluids such as oil spills from the surface of bodies of water which comprises placing an adsorbant compound on the water surface in contact with the immiscible fluid and maintaining contact between the surface of the immiscible fluid and the adsorbant material until the immiscible fluid is adsorbed. The adsorbant compound consists of an admixture comprising from between about 30% and 70% by weight of lead slag mineral wool, with the balance being a finely divided natural stone substance containing substantial quantities of iron, aluminum, and magnesium oxides, including such natural stones as trap rock, basalt and gabbro. The lead slag mineral wool is treated with a hydrophobic-oil-soluble hydrocarbon chain substance, such as oleic acid to wet the surface of the mineral wool prior to mixing with stone flour. The lead slag mineral wool is preferably fragmented into nodules having a diameter of, for example, from 1/4 inch to 1 inch. The composition may be also utilized for removing oil spills from lake beds or soil surfaces.

Keywords: Pollutant absorption

U.S. Cl. X.R. 210-40; 210-DIG.21

No Figure

275

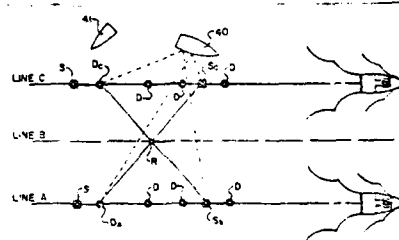
3,934,220  
**METHOD OF SEISMIC EXPLORATION FOR  
 PENETRATING DIFFRACTION BARRIERS AND/OR  
 SURVEYING BENEATH OBSTACLES**  
 JLee Davis, Ector, Tex., assignor to Avance Oil & Gas Com-  
 pany, Inc., Midland, Tex.  
 Continuation of Ser. No. 376,219, July 3, 1973, abandoned,  
 which is a continuation-in-part of Ser. No. 145,811, May 21,  
 1971, Pat. No. 3,746,122. This application Jan. 22, 1975, Ser.  
 No. 542,941  
 Int. Cl.<sup>7</sup> G01V 1/20  
 U.S. Cl. 340—15.5 MC 2 Claims

A number of seismic detectors are located in a two-dimensional array on the surface of the earth, either on land or at sea. One or more seismic disturbances are produced in the vicinity of the seismic detectors at points located to produce sampling of various subsurface reflection points to form one or more two-dimensional areas of coverage. For each seismic disturbance, the subsurface reflections thereof received by the various seismic detectors are recorded. In some embodiments, the seismic disturbances are produced at points located to produce multi-directional or multi-azimuth sampling of each of various subsurface reflection points and recordings for different ones of the seismic disturbances are combined to produce stacked recordings wherein multi-directional reflections from common subsurface points are added. By sampling a reflecting point in a multi-directional manner and stacking the recorded samples, diffraction barriers can be effectively penetrated to produce a discernable sig-

Keywords: Seismic survey method

U.S. Cl. X.R. 340-7R; 340-15.5CP

nal representing the reflecting point notwithstanding the diffraction barrier. Multi-directional or multi-azimuth sampling of reflecting points can be employed to survey beneath surface features such as inhabited areas or seismically opaque features such as salt pockets by utilizing source points and detecting points located away from and on opposite sides of the blocking feature.



JANUARY 27, 1976

3,934,422  
**PILE SPlicing APPARATUS AND METHOD**  
 Larry E. Fredrickson, and Thomas L. Coates, both of 529 S.  
 49th St., Tacoma, Wash. 98404  
 Filed Nov. 11, 1974, Ser. No. 522,777  
 Int. Cl.<sup>2</sup> E02D 5/60  
 U.S. Cl. 61—53 10 Claims

Top and bottom segments of marine piling are spliced and reinforced in situ by surrounding them with an elongated cage of concrete mesh rebar stock or like material, surrounding the cage with an elongated concrete form bag, spacing the cage from the piling and the form bag from the cage, and pouring the form bag full of concrete mix thereby integrating the piling segments, the cage and the form bag into a repaired or spliced pile of substantial strength. Where the splice extends below the mud line, the area about the pile first is excavated down into the underlying solid ground to provide a concrete turn basin which also is filled with concrete to provide a footing for the spliced pile.

Keywords: Concrete form; Pile, concrete; Pile, wood; Structure repair

U.S. Cl. X.R. 52-169; 52-514; 61-54



3,934,528

**MEANS AND METHODS FOR ANCHORING AN OFFSHORE TENSION LEG PLATFORM**

Edward E. Horton, Portuguese Bend; John H. Brewer, Irvine; William H. Silcox, Newport Beach, and T. A. Hudson, Balboa Island, all of Calif., assignors to Deep Oil Technology, Inc., Long Beach and Chevron Oil Field Research Co., La Habra, both of Calif.

Filed June 3, 1974, Ser. No. 475,800

Int. Cl.<sup>2</sup> B63B 35/44

U.S. Cl. 114-.5 D

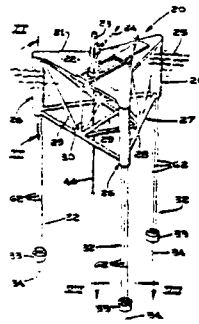
20 Claims

An apparatus and method for anchoring an offshore tension leg platform which includes a platform supported above an ocean surface by buoyant supports comprising at least three vertical buoyant support members. Each vertical support member includes a central axial conductor tube for passage of drill pipe adapted to be connected to anchor members carried at the bottom of the vertical support member, the drill pipe providing a for lowering the anchor member, for drilling beneath the anchor member to pin the anchor member in the ocean bottom, and for transfer of ballast from the vertical support member to the anchor member. Each vertical support member includes longitudinally extending anchor line casings spaced from the axial tube to provide passageways for anchor tension lines connected to the anchor and adapted to be tensioned at the upper end of the vertical support member or at the platform. A method of anchoring a

**Keywords:** Offshore platform anchor; Offshore platform, floating

U.S. Cl. X.R. 61-46.5; 114-43.5R

tension leg platform wherein anchor members are substantially empty when lowered and are filled with ballast material at or near the sea floor. A method which includes advantages in mobility, installation, and anchoring of a tension leg platform under varying weather and sea conditions.



3,934,658

**MODULAR UNDERWATER WELL PLATFORM SYSTEM**

Norman A. Nelson, 2422 W. 18th St., Apt. 169, Houston, Tex. 77008

Filed Sept. 19, 1974, Ser. No. 507,182

Int. Cl.<sup>2</sup> E21B 15/02

U.S. Cl. 175-7

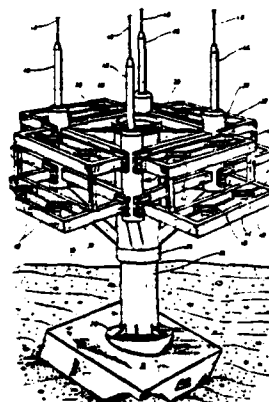
15 Claims

A modular underwater well platform system comprising a plurality of modular units which are assembled and connected to the underwater floor based on results obtained as drilling of wells progresses and which allows flexibility in the positioning, size, and location of the platform while reducing the expense and time required for manufacturing and construction of the platform. A first guide base is provided connected to the underwater floor by the initial exploratory well pipe and the base includes a plurality of connecting and supporting frames directed outwardly in various directions and having interconnecting elements for allowing interconnection with additional modular guide bases in any of the various directions. After an exploratory well or wells has been drilled through an opening in the first base and when the results of the first wells indicate the location at which the platform is to be constructed, one or more spacer members having first and second ends, the first end of which includes interconnecting elements may be connected to one of the interconnecting elements of one of the frames of the first guide base for extending the base of the platform in the desired direction. One or more additional guide bases may be connected to the second ends of the spacing members and supported from the under-

**Keywords:** Offshore construction; Offshore platform, fixed; Seabed foundation

U.S. Cl. X.R. 61-46

water floor. The platform base can then be extended in any desired direction with the modular components as indicated by the results of further drilling. The interconnecting elements between the guide bases and the spacer members may include vertical telescoping members and locking means. The guide bases may include vertical guide means for coaxing with and supporting upper support structures from the guide bases for building up the drilling structure to the desired height.



3,935,592

**RECORDING INSTRUMENT ADAPTED FOR USE IN  
REMOTE UNATTENDED LOCATIONS**

John M. Dahlen, Duxbury; William E. Toth, Bolton; John T. Shillingford, Jr., Watertown, and John F. McKenna, Jr., Gloucester, all of Mass., assignors to Massachusetts Institute of Technology, Cambridge, Mass.

Filed Feb. 22, 1974, Ser. No. 444,948

Int. Cl. G11b 5/09; G01d 11/24

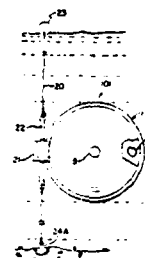
U.S. Cl. 360-6

7 Claims

A recording instrument for use in ocean depths and like remote locations and adapted to provide meaningful readings of temperatures and pressure, for example, at such locations over a long period of time without attendance. Analog signals from transducers, which indicate the level of the thing-to-be-measured, are processed to give an averaged digital signal that is then stored on a magnetic tape. The system is battery powered. The instrument detailed is for use at ocean depths where the instrument housing and attachment to a mooring line are of particular importance.

Keywords: Bathythermograph; Buoy, instrumented; Depth pressure measurement

U.S. Cl. X.R. 346-33M; 360-39; 360-51



FEBRUARY 3, 1976

3,935,908

**PILE HAMMERS**

Charles R. Pepe, Old Quarry Road, Alpine, N.J. 07620  
Continuation-in-part of Ser. No. 251,785, May 9, 1972, Pat.  
No. 3,838,741. This application Aug. 7, 1974, Ser. No.  
498,381

Int. Cl. E02D 7/10

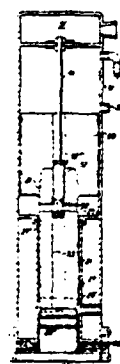
U.S. Cl. 173-127

6 Claims

Power hammers for driving piling, and the like, free of any complex valve mechanism likely to require attention and comprising a working cylinder having an anvil at the lower end thereof and a ram operative as a piston in the cylinder, cooperative with the anvil and surrounding walls of the cylinder to form an expansion chamber, the ram having a passage extending from an annular groove intermediate the ends of the ram, down through the lower end to the expansion chamber and the cylinder having pressure supply and exhaust ports to register with the passage and to be uncovered by the ram, in lower and upper positions of the ram in the cylinder, whereby the essential functions of the hammer are automatically effected in the normal operation of the ram. Pressure controlled valves may be added to automatically hold desired pressures and release opposing pressures on the ram.

Keywords: Pile driver, impact

U.S. Cl. X.R. 91-234



3,936,377

# OIL SEPARATION AND RECOVERY METHOD

Frank Galicia, 5043 Catherine St., Philadelphia, Pa. 19143  
 Division of Ser. No. 352,209, April 18, 1973, Pat. No.  
 3,890,234. This application Apr. 3, 1975, Ser. No. 564,815  
 Int. Cl.<sup>3</sup> B01D 21/00

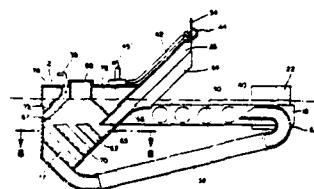
U.S. Cl. 210-84

9 Claims

An oil separation method and recovery device which may be towed or otherwise propelled over, or left stationary on, the surface of a body of oil polluted water. If the unit is in motion, inverted V-shaped troughs intersect the liquid surface causing the oil polluted water to flow into an inner chamber as the oil rises to the trough vertices. If stationary, high pressure water is used to force the oil polluted water along the troughs to the inner chamber as a vacuum is created. In either case, but particularly the latter, the contaminated water flow path is improved by utilizing depolluted discharging water to induce a surface current of the oil polluted water to flow toward the troughs. Also, the utilization of a heating means keeps the oil flowing expeditiously through the troughs.

Keywords: Pollutant collection; Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.25



FEBRUARY 10, 1976

3,937,078

# SENSING APPARATUS FOR INCLINOMETERS

Gerald J. Williams, Miami, Fla., assignor to General Oceanus, Inc., Miami, Fla.

Filed Apr. 10, 1974, Ser. No. 459,658  
 Int. Cl.<sup>3</sup> G01P 5/06

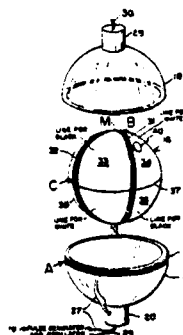
U.S. Cl. 73-189

4 Claims

An apparatus for sensing the orientation of an inclinometer in both direction and magnitude for determining the velocity and direction of currents in a body of water having a magnetic north seeking sphere buoyantly supported in a housing. Implanted on the sphere is a plurality of tuned circuits of different resonant frequencies set at right angles to each other and a sense-drive winding or coil mounted about the housing. Upon applying a series of pulses of voltage to the sense-drive coil, the tuned circuits will oscillate with decaying amplitude at their resonant frequencies in the intervals between the pulses of voltage. The mean voltage across each of the tuned circuits is a measure of the amount and direction of tilt of the housing caused by the currents. The sense-drive coil senses these voltages across the tuned circuits and between the induced pulses of voltages, will transmit them to conventional recording equipment whereby a continuous determination of the currents velocity and direction are obtained.

Keywords: Buoy, instrumented; Current measurement

U.S. Cl. X.R. 33-352; 33-363Q; 250-231R; 340-196



3,937,170  
**BUMPER GUARD AND ARRANGEMENT FOR WATER COVERED AREAS**

Glen E. Drewett, P. O. Drawer 52627, Lafayette, La. 70501

Filed Oct. 29, 1974, Ser. No. 518,354

Int. Cl.<sup>2</sup> B63B 69/02; F16F 7/12

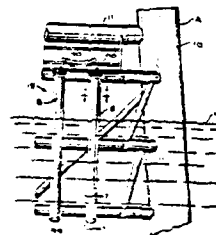
U.S. Cl. 114-219

30 Claims

A support frame is positioned on a structure in a water covered area and receives and supports an elongated elastomer body to function as a bumper guard to protect the structure and vessel when contact is made. The support frame and the elongated elastomer body are constructed and arranged so that the elongated elastomer body may be positioned in the support from above water level, and may be withdrawn and replaced when necessary from above water level. The support frame includes inwardly extending plates to engage the elongated elastomer body to position it on the support frame and the elongated elastomer body is constructed and arranged to absorb shock, protect the support frame, and includes one or more rigid reinforcing members to inhibit unwanted or accidental removal of the elongated member from the support frames.

**Keywords:** Offshore structure fender; Pier fender

U.S. Cl. X.R. 267-140; 293-71R



3,937,296  
**FIRING DEVICE, EXPLOSIVE CHARGE, METHOD, AND SYSTEM, FOR SEISMIC EXPLORATION**

Richard R. Larson, Ulster Park, N.Y., assignor to Hercules Incorporated, Wilmington, Del.

Continuation-in-part of Ser. No. 818,475, April 21, 1969, Pat. No. 3,574,298. This application Feb. 26, 1970, Ser. No. 14,321

Int. Cl.<sup>2</sup> G01V 1/38; F42D 3/06

U.S. Cl. 181-118

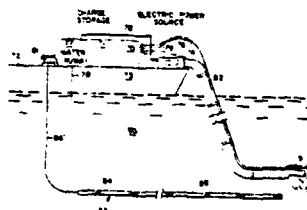
22 Claims

A firing device is provided for initiation of delay type seismic charge assemblies, which comprises means for conveying and guiding the charge assemblies, in the seismic test zone, into electrical initiation contact with one of any number of available pairs of electrical conductor surfaces, insulated from the other and adapted to connect with opposite poles of an external firing current source; and means for directing the thus initiated assemblies from the initiation zone, during the delay period, for subsequent detonation.

Also provided are elongated end-recessed seismic charge assemblies initiated in the above device; and seismic exploration system, and method, utilizing said device.

**Keywords:** Seismic explosive acoustic transmitter; Seismic survey method

U.S. Cl. X.R. 340-7R; 181-110; 181-114





FEBRUARY 17, 1976

3,938,339

MEANS FOR SLOWING AND/OR DETOURING WATER  
CURRENTS AND THE PREPARATION THEREOF  
Yves Gaudard, Lyon, France, assignor to Rhone-  
Poulenc-Textile, Paris, France  
Filed July 29, 1974, Ser. No. 492,825  
Claims priority, application France, Aug. 3,  
1973, 73.28757

Int. Cl.<sup>2</sup> E02B 3/02, 3/06  
U.S. Cl. 61-4 8 Claims

A jetty arranged angularly to the edges of a body of water so as to slow down or detour the currents having a pile of fill with its base resting on an excavation and an unwoven fabric surrounding the pile with wave breaking means surmounting the pile.

Keywords: Fabric mat; Groin; Jetty; Offshore construction; Seabed foundation

U.S. Cl. X.R. 61-30



3,938,341

STORAGE DEVICE FOR LIQUIDS

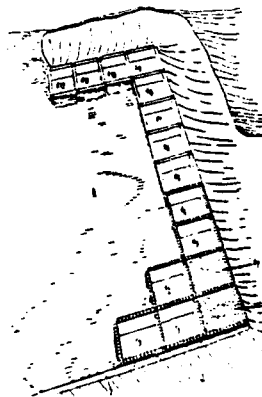
Theodorus Prins, Rivierdijk 653, Sliedrecht, Netherlands  
Filed June 28, 1972, Ser. No. 267,037  
Claims priority, application Netherlands, Aug. 5, 1971,  
7110804

Int. Cl.<sup>2</sup> B65G 5/00; E02B 3/04; E02D 5/00  
U.S. Cl. 61-46 5 Claims

Storage device for example for natural oil products wherein a dike or dam in a water mass encloses a rectangular area at least partly. In the enclosed area a reservoir is formed which, just like the dam, is composed of contiguous compartments, each compartment being laterally defined by caissons.

Keywords: Offshore caisson; Offshore construction; Offshore storage tank, emergent

U.S. Cl. X.R. 61-1R; 61-4; 61-30



3,938,342  
METHOD AND A DEVICE FOR BUILDING IMMERSED  
FOUNDATIONS

Jean Aubert, 8 rue la Bouteille, Paris 8, (Seine), France  
Filed June 4, 1973, Ser. No. 366,354 The portion of the term  
of this patent subsequent to Mar. 13, 1990, has been  
disclaimed.

Int. Cl.<sup>1</sup> E02B 3/06, 7/00

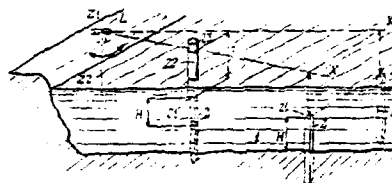
U.S. Cl. 61-46

17 Claims

In a method for building immersed foundations on a prepared bed without preliminary unwatering by means of a platform which is intended to support the final structure, the steps which consist in positioning in the underwater bed a support having at least three bearing points which are so adjusted as to project from the bed to a height corresponding to the intended depth of the seating plane, in lowering the platform onto the bearing points, in placing a hardenable material such as concrete or mortar on the foundation bed so as to imprison at least the lower ends of anchoring means which extend downwards from the platform.

Keywords: Concrete form; Grouting; Offshore construction; Seabed foundation; Seabed material placement

U.S. Cl. X.R. 61-49; 61-50



3,938,343  
PLATFORM STRUCTURE FOR MARITIME  
INSTALLATION

Jacques Edouard Lamy, Fontenay-aux-Roses, France, assignor  
to C. G. Doris, Paris, France

Filed Nov. 5, 1974, Ser. No. 521,075

Claims priority, application France, Nov. 13, 1973,  
73.40272; May 20, 1974, 74.17478

Int. Cl.<sup>1</sup> E02B 17/00, 3/04

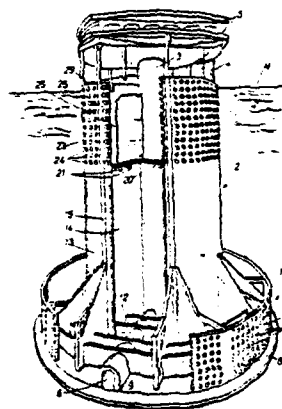
U.S. Cl. 61-46.5

21 Claims

A platform structure for maritime installations, designed to rest under its own weight upon the seabed through the medium of a base acting as the foot of a tower surmounted by an emergent superstructure, comprising a strong, watertight tubular member incorporated into the structure in order to form a shaft or chimney extending from top to bottom of the structure in order to protect the components of the installation against corrosion and shock loading, and in order also to make it possible to carry out in the dry the various operations required by the process. The tubular member can be used without a base in order to give direct access to the seabed. Preferentially, the tubular member will communicate with one or more radial, watertight tunnels formed in the base.

Keywords: Offshore platform, fixed; Pile driver, water jet; Seabed foundation

U.S. Cl. X.R. 49-68; 61-4; 61-72.3



3,938,462

**BOAT MOORING APPARATUS**

Bertil Braudt, 6, Rue Alfred de Vigny, Paris, France

Filed Mar. 26, 1974, Ser. No. 454,987

Claims priority, application Sweden, Mar. 27, 1973, 7304277

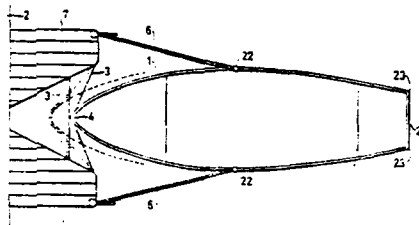
Int. Cl.<sup>2</sup> B63B 21/00

U.S. Cl. 114—230

3 Claims

Apparatus for mooring boats and being of the type which fixedly secures one end of the boat while simultaneously preventing pivoting of the boat about said one end in response to wind and wave forces acting on the boat. A fixed support platform is provided which includes a pair of spaced support elements, and at least one stretchable elastic member is supported between the spaced support elements. In the mooring of the boat, one end of the boat is positioned against the elastic members, and thereafter a plurality of lines are attached to opposite sides of the boat at points located remotely from said one end of the boat. The latter lines are placed in tension and are so orientated relevant to the boat that force components are provided which act parallel to the longitudinal axis of the boat and resiliently urge the boat against the elastic members so as to distend the member and provide a recess therein for embracing and fixedly securing said one end of the boat. Simultaneously, the tensioned lines provide force components acting transversely of the longitudinal axis of the boat to prevent pivoting of the boat about its first end.

Keywords: Small-craft mooring device



3,939,408

**CONDUCTIVITY CELL AND MEASURING SYSTEM**

Neil L. Brown, Falmouth, Mass., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Aug. 5, 1974, Ser. No. 494,808

Int. Cl.<sup>2</sup> G01N 27/42

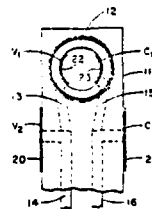
U.S. Cl. 324—30 B

11 Claims

A four electrode T-shaped conductivity cell has one pair of external electrodes affixed to opposite sides of the stem member and one pair of internal electrodes affixed to diametrically opposite arcuated portions of the inner wall surface of an open-ended tube which serves as the crosshead member of the T. The "voltage" electrodes of the cells are connected in the input circuit of a high gain amplifier which has a negative feedback loop in which the "current" electrodes are connected. An AC reference signal is coupled to this input circuit and is canceled by the voltage developed across the "voltage" electrodes. The feedback current, which is responsible for this condition and is proportional to the conductivity of the electrolyte, is converted to an output voltage whose magnitude with respect to that of the reference signal yields a ratio which is linearly proportional to the conductivity.

Keywords: Salinity measurement

U.S. Cl. X.R. 204-195F; 324-30R



3,939,466  
**SPATIALLY DISTRIBUTED TRANSDUCER FOR TOWED  
 LINE ARRAY APPLICATIONS**

Tibor G. Horwath, San Diego, Calif., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Jan. 24, 1975, Ser. No. 543,749  
 Int. Cl.<sup>2</sup> G01V 1/38, 1/16

U.S. Cl. 340-7 R

6 Claims

Transducers based on the variable reluctance concept, employing magnetizable, soft, plastic materials. These materials serve as the isolator between the conductors of a coaxial cable. Such materials exist in considerable variety. The magnetization is azimuthal, such as can be generated by electrical currents flowing through the coaxial cable. Any isolated section of the coaxial cable constitutes a transducer, the conductors at one end of which form the terminals, while those at the other end are connected together to provide a closed electrical circuit. Pressure changes, caused, for example, by acoustic signals, on the outer surface of this transducer produce changes in volume, which in turn induce electrical signals due to changes of the magnetic flux. The conductors of the cable transducer can be in the form of wire braids or metal films, neither of which will significantly change the elastic characteristics of the magnetizable plastic material.

Transducers of this type exhibit an electrical source impedance which is essentially equal to the resistance of the conductors. This eliminates the need of impedance changing preamplifiers. The output signals can be, therefore, transmitted directly over long distances by simple wires placed in the interior of the central, hollow, inner conductor.

3,939,468  
**DIFFERENTIAL CHARGE AMPLIFIER FOR MARINE  
 SEISMIC APPLICATIONS**

Robert H. Mastin, Dallas, Tex., assignor to Whitehall Corporation, Richardson, Tex.

Filed Jan. 8, 1974, Ser. No. 431,723  
 Int. Cl.<sup>2</sup> G01V 1/00

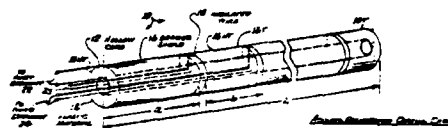
U.S. Cl. 340-7

29 Claims

A differential charge amplifier for use in towed marine seismic streamers and the like involving towed hydrophone arrays wherein the hydrophone outputs are conducted by long twisted pairs of leads to signal processing equipment, the differential charge amplifier including operational amplifiers connected to form charge amplifier stages having resistance-capacitance feedback circuits and a differential amplifier stage coupled to the charge amplifier outputs providing cancellation of common mode signals.

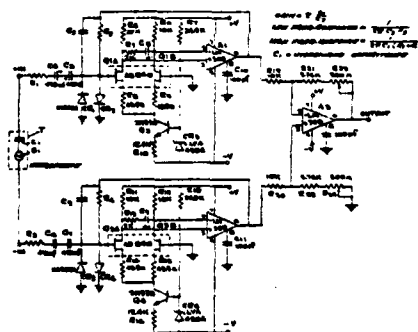
Keywords: Seismic hydrophone; Seismic streamer cable

U.S. Cl. X.R. 29-594; 73-90; 340-8FT; 340-9



Keywords: Seismic record processor; Seismic streamer cable

U.S. Cl. X.R. 340-17; 330-7



FEBRUARY 24, 1976

3,939,663

**OIL FENCE HAVING DIRECTIONAL CONTROL DEVICE**

Toshiyata Tezuka; Hiroshi Kawakami, both of Kamakura, and Katsutoshi Miura, Yokohama, all of Japan, assignors to Bridgestone Tire Company, Ltd., Tokyo, Japan  
Filed Sept. 27, 1974, Ser. No. 509,998

Claims priority, application Japan, Sept. 28, 1973, 48-112300[U]

Int. Cl.<sup>2</sup> E02B 15/04

U.S. Cl. 61-1 F

4 Claims

An oil fence having a directional control device consisting of rudder plates or wind receiver plates secured to vertical plates or skirts of the fence at an angle thereto, which are subjected to a force due to relative movement of water or wind to cause the fence to position at an angle relative to the direction of the movement of the water or wind, whereby when the oil fence is being tugged by a towing boat the oil fence line is positioned at an angle without being subjected to any bending moment or any other undue force so as to collect or recover pollutants, e.g., spilt oil effectively from water surface.

Keywords: Pollutant collection; Pollutant, surface barrier



3,939,664

**LARGE DIAMETER TUBULAR PILES AND THE BEDDING THEREOF**

Georges Mazier, Avon; Jean Paul Gelfriaud, Croissy-sur-Seine, and Daniel Gouvenot, Clichy, all of France, assignors to Solmarine S.A., Paris, France

Filed July 3, 1974, Ser. No. 485,705

Claims priority, application France, July 9, 1973, 73.25034

Int. Cl.<sup>2</sup> E02D 23/16, 5/22

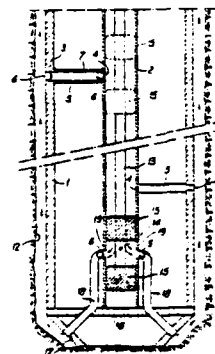
U.S. Cl. 61-53.58

6 Claims

A large diameter tubular pile for bedding into a borehole has an auxiliary tube extending inside it and a series of axially spaced apart holes through its wall which communicate with the interior of the auxiliary tube through discharge pipes which are arranged to allow flow only from the auxiliary tube to outside the pile. The pile is bedded in a borehole by first inserting the pile and then introducing into the auxiliary tube an injection pipe having a pair of axially spaced apart plugs which seal against the inner wall of the auxiliary tube. The injection pipe is located so that the plugs seal on opposite sides of an opening into a discharge pipe, and grout under pressure is forced from the injection pipe through the discharge pipe into the borehole around the pile. This procedure may be repeated for the other discharge pipes.

Keywords: Grouting; Pile footing; Pile, steel; Seabed foundation

U.S. Cl. X.R. 61-41R; 61-53.74



285

3,939,665  
METHOD FOR PROTECTING METAL H-PIILING IN  
UNDERWATER ENVIRONMENTS AND PROTECTED H-  
PIILING

Joseph F. Gosse, Coopersburg, and George V. Fehr, Nazareth,  
both of Pa., assignors to Bethlehem Steel Corporation, Beth-  
lehem, Pa.

Filed Jan. 8, 1974, Ser. No. 431,814  
Int. Cl.<sup>2</sup> E02D 5/60

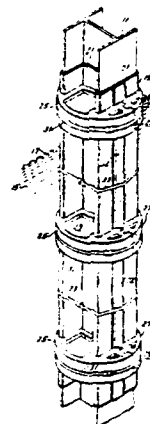
U.S. Cl. 61-54

3 Claims

A metal H-piling is protected from corrosion in under-  
water and semi-underwater locations by the applica-  
tion of a coating of a corrosion resistant covering con-  
sisting of an outer shield of stiff plastic, an inner layer  
of a corrosion inhibiting material and a series of ex-  
panded plastic clamping members having an internal  
shape corresponding substantially to the outer shape  
and dimensions of the H-piling. The expanded plastic  
clamping members serve to hold the outer plastic  
shields, which are preferably in the shape of half sec-  
tions of the outer dimensions of the H-pile, tightly  
against the outer surfaces of the H-pile. The clamps,  
which are preferably in the form of two interlocking  
sections may be held together by corrosion resistant  
strapping.

Keywords: Coating; Corrosion prevention;  
Pile, steel

U.S. Cl. X.R. 52-170; 52-728



3,940,339  
LITHIUM BORATE COMPLEX GREASE EXHIBITING  
SALT WATER CORROSION RESISTANCE

George A. Clarke, Jr., and Gary L. Harting, both of Westfield,  
N.J., assignors to Exxon Research & Engineering Co., Lin-  
den, N.J.

Filed Jan. 21, 1975, Ser. No. 542,800  
Int. Cl.<sup>2</sup> C10M 3/18, 5/14, 7/20, 7/24

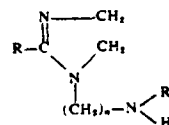
U.S. Cl. 252-18

7 Claims

A lubricating grease having an exceptional ability to  
protect metal bearing surfaces against rusting or cor-  
rosion in the presence of salt water contains a syner-  
gistic combination of a lithium complex grease thick-  
ener, a quaternary ammonium nitrate and an amino  
imidazoline. The grease thickener is a complex of a  
lithium soap of a C<sub>12</sub> to C<sub>24</sub> hydroxy fatty acid and a  
monolithium salt of boric acid, and can include as a  
third component a lithium salt of a second hydrox-  
ycarboxylic acid such as salicylic acid

Keywords: Corrosion prevention

U.S. Cl. X.R. 252-25; 252-392



3,940,732

**BUOYANT ELECTRODE AND SYSTEM FOR HIGH SPEED TOWING**

John A. Hudson, and Mitchell J. Yelverton, both of Panama City, Fla., assignors to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Mar. 30, 1970, Ser. No. 24,016

Int. Cl.<sup>2</sup> H01B 7/12

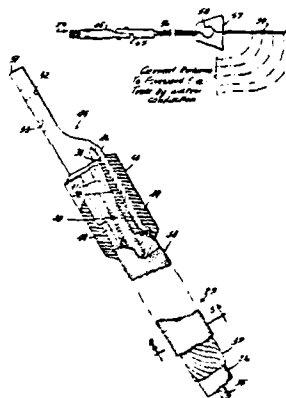
U.S. Cl. 340-4 E

8 Claims

An electrode structure is disclosed which is particularly adapted for high density electrical current transfer to sea water. The electrode of the invention is adapted to be towed within sea water by an aircraft at high rates of speed. The electrode comprises a nonmetallic, high tensile strength central strain member, a concentric buoyant encasing layer, and an outer current carrying layer. Specific end construction is disclosed to compensate for differential electrolytic erosion of the electrode. Improved connector construction is described which provides for transmission of towing force to the electrode, as well as the transfer of electrical energy thereto. Further, specific terminating construction, which provides for the towing of both powered as well as nonpowered loads, is described.

Keywords: Instrument deployment; Seabed property measurement; Towing cable

U.S. Cl. X.R. 114-235B; 174-101.5; 340-3T



MARCH 2, 1976

3,940,982

**SUBBOTTOM ROCK MAPPING PROBE**

Melvin C. Hironaka, Camarillo, Calif., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Sept. 16, 1974, Ser. No. 506,372

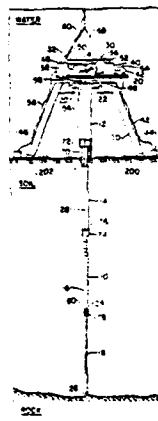
Int. Cl.<sup>2</sup> G01W 1/00

U.S. Cl. 73-170 A

8 Claims

A subbottom rock mapping probe for measuring the thickness of a sediment layer located on the bottom of a body of water comprising an automatic, downwardly extending, telescoping probe that is gimbally connected to a support member. Water is forced through the probe to disperse the sediment impeding the probe's downward extension. Recording equipment and related measuring devices measure and record the depth of penetration of the probe into the sediment layer from an initial or reference position.

Keywords: Instrument, seabed in situ; Sedimentation measurement



AD-A080 797

COASTAL ENGINEERING RESEARCH CENTER FORT BELVOIR VA

F/8 13/2

AN ANNOTATED BIBLIOGRAPHY OF PATENTS RELATED TO COASTAL ENGINEER--ETC(U)

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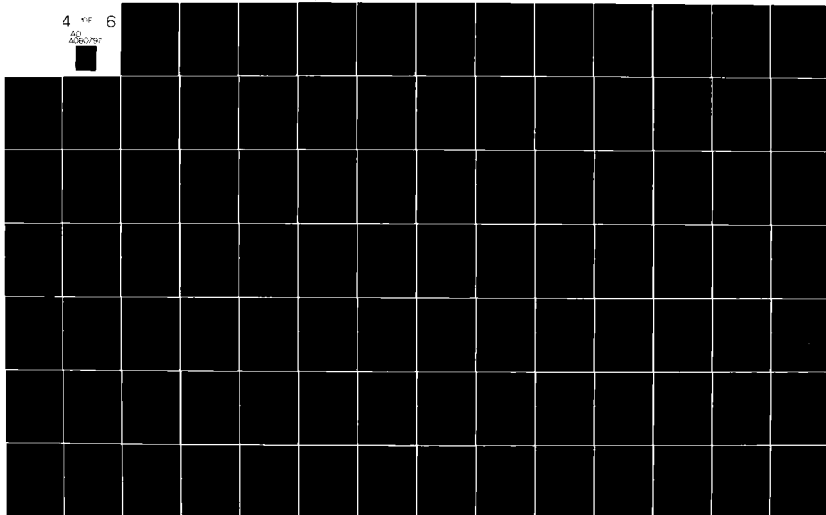
UNCLASSIFIED

CERC-MR-79-6-VOL-3-APP

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50  
AD-8080797





3,941,694

**PROCESS FOR REDUCING THE ADHERENCE OF OIL TO SILICEOUS MATERIAL**

Paul R. Scott, Houston, Tex., assignor to Shell Oil Company, Houston, Tex.

Continuation-in-part of Ser. No. 15,952, March 2, 1970, abandoned. This application Apr. 29, 1971, Ser. No. 135,760  
Int. Cl.<sup>2</sup> C02B 9/02

U.S. Cl. 210-40

11 Claims

The adherence of oil to siliceous material, such as beach sand, is reduced by contacting the material with a blend of a primary long chain alcohol and an aliphatic solvent either before or after the oil contacts the siliceous material.

**Keywords:** Pollutant coalescence

U.S. Cl. X.R. 210-59

No Figure

3,942,149

**SOLID STATE DEPTH SOUNDER**

Wilmer J. Westfall, Jr., Farmers Branch, Tex., assignor to Texas Instruments Incorporated, Dallas, Tex.

Filed Aug. 19, 1974, Ser. No. 498,801  
Int. Cl.<sup>2</sup> G01S 9/68, 7/60

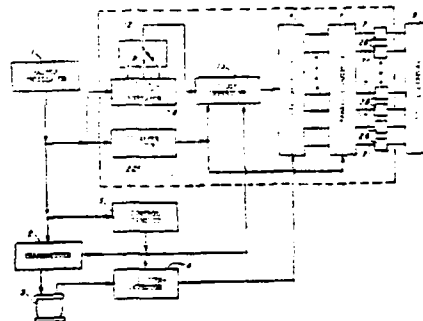
U.S. Cl. 340-3 R

23 Claims

A solid state depth sounding system, for measuring depth and detecting the presence of underwater objects, comprises an oscillator, producing high frequency electrical signals, a transmitter, for intermittently amplifying those signals, a transducer, and a receiver. The transducer produces high frequency sound impulses from the intermittent amplified signals, and transmits those impulses through the water until they are reflected by some underwater object. The transducer also picks up the reflected sound impulses and provides a high frequency electrical signal to the receiver which amplifies and detects it to produce a return pulse related in analog value to the strength of the reflected signal. The time delay between the transmission and reception of the high frequency sound impulse, and consequently the distance to the reflecting object, is measured by applying either a transmit pulse or a return pulse to the serial input of a multibit BBD or CCD shift register with a specified number of parallel outputs. When the contents of the shift register are sampled, the pulse or pulses in the register are used to drive display elements corresponding to the bit or bits in which those pulses are found. A properly calibrated display, driven by these pulses will indicate the presence and depth of underwater reflecting objects. By applying the analog return pulse to the input of the shift register, and by sampling at predetermined intervals the display will indicate, by the relative intensity of the driven display elements, the relative strength of the reflected signals. A number of such solid state depth sounders may be used to provide multidirectional depth measuring and detection with a single co-ordinated display. The display device and signal processing equipment are designed to indicate the lateral distance to a reflecting object as well as its depth.

**Keywords:** Sonar, depth sounder

U.S. Cl. X.R. 340-1C; 340-3C; 340-3F; 343-13R



MARCH 9, 1976

3,943,483

DEPTH CONTROLLERS FOR SEISMIC STREAMER  
CABLES WITH DIMENSION VARIABLE  
LIFT-PRODUCING MEANS

Booth B. Strange, Houston, Tex., assignor to Western Geophysical Company of America, Houston, Tex.

Filed May 8, 1974, Ser. No. 468,127

Int. Cl.<sup>2</sup> G01V 1/00, B60P 3/00

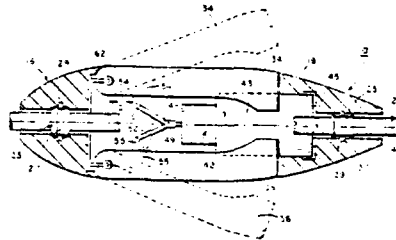
U.S. Cl. 340—7 PC

12 Claims

A depth controller having a streamlined body which comprises retractable and extendable lift producing means, such as a main pair of vanes that can produce a variable negative lift and an auxiliary pair of vanes that can produce a variable positive lift. Each pair is movable by translation or rotation in a single plane, inclined relative to the horizontal. Depth control means are operatively coupled to retract the main pair of vanes inward as the controller moves from the water surface down to a reference depth and to extend the auxiliary pair of vanes outward as the controller falls below the reference depth. Each controller can be used to effectively maintain a seismic streamer cable section at or near the desired reference depth.

Keywords: Seismic streamer cable; Towed body depth control

U.S. Cl. X.R. 43-43.13; 114-235B



3,943,484

METHOD OF ATTENUATING UNWANTED SEISMIC  
REFLECTIONS IN UNDERWATER SEISMIC  
EXPLORATION

Vearle Spurlock Balderson, Dallas, Tex., assignor to Avance Oil & Gas Company, Inc., Midland, Tex.

Filed Nov. 26, 1973, Ser. No. 418,964

Int. Cl.<sup>2</sup> G01V 1/38

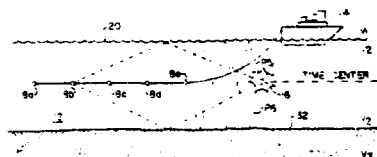
U.S. Cl. 340—7 R

3 Claims

A string of seismic detectors is towed at a certain depth underwater by a survey boat over an area to be explored. A seismic disturbance is produced at a distance below the surface of the water such that the propagation time of seismic waves traveling from the disturbance and reflected from the water surface to the detectors is substantially the same as the propagation time of seismic waves traveling from the disturbance and reflected from the water floor to the detectors. Since the seismic waves reflected from the water surface are out of phase with those reflected from the water floor, the reflected waves tend to cancel or attenuate, thereby eliminating or minimizing these unwanted seismic signals.

Keywords: Seismic survey method

U.S. Cl. X.R. 340-15.5CP



MARCH 16, 1976

3,943,644

MINING DREDGE HAVING ENDLESS BUCKET  
CONVEYOR AND FLEXIBLE GUIDE TRAIN

Alfons Walz, Alfons-Walz-Strasse 1-5, 7967 Bad Waldsee,  
Germany

Filed June 25, 1974, Ser. No. 483,068

Claims priority, application Germany, June 25, 1973,  
2332198

Int. Cl.<sup>2</sup> E02F 3/08

U.S. Cl. 37-69

41 Claims

A device for mining the bottom of a body of water for ores and minerals, having a flexible combined guide train and conveying train assembly suspended between a drive unit on board a ship and a receiving unit. The latter is towed along the bottom, so as to scrape or scoop up the wanted materials, by means of the resiliently stretchable combined train assembly. This assembly comprises synthetic rope strands in both the guide train assembly and the conveying train, guide units being spaced along the guide train assembly for the interference-free guidance of the conveying buckets attached to the multiple strands of the conveying train. The receiving unit, equipped with various monitoring sensors, is also linked to a buoy, by means of which it can be raised for transport and repositioning.

Keywords: Dredge, mechanical

U.S. Cl. X.R. 37-DIG.8; 198-109



3,943,720

FLOATING OIL BARRIER

Jerome H. McGram, Cambridge, Mass., assignor to Offshore  
Devices, Inc., Lynn, Mass.

Filed Aug. 30, 1974, Ser. No. 501,870

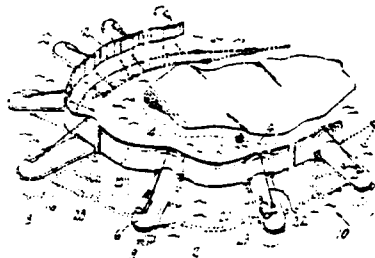
Int. Cl.<sup>2</sup> E02B 15/04

U.S. Cl. 61-1 F

8 Claims

An oil barrier for use in the open sea to contain oil on the surface, comprising a flexible barrier provided with a plurality of flotation means only on the outside of the barrier, thereby avoiding churning of the oil and water on the inside of the barrier into an oil-water mixture that could pass under the barrier in rough sea conditions. In one embodiment of the invention, the flotation means is a plurality of inflatable members packaged on the outside surface of the barrier, with a counter weight associated with the flotation means so as to be disposed on the end of the flotation means opposite the barrier when the flotation means is inflated, so that the center of gravity of the assembly is in the desired position in relation to the center of buoyancy thereof.

Keywords: Pollutant, surface barrier



3,943,724

**UNDERWATER STATIONARY TANK FOR STORING  
LARGE AMOUNTS OF CRUDE OIL**

Valeriano Banzoli, Mestre; Giovanni De Nora, Spinea; Vincenzo Di Teila, Cappella di Torre Gavetta (Naples); Domenico Lalli, Mogliano Veneto, and Gianfranco Tempo, Venezia Lido, all of Italy, assignors to Tecnomare S.p.A., San Donato Milanese, Italy

Filed Apr. 11, 1974, Ser. No. 460,220

Claims priority, application Italy, Apr. 13, 1973, 22953/73  
Int. Cl.<sup>2</sup> B65D 36/16

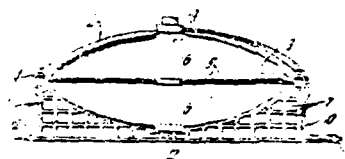
U.S. Cl. 61-46.5

3 Claims

**Keywords:** Offshore storage tank, submerged;  
Seabed foundation

U.S. Cl. X.R. 114-.5T

A submersible oil-storage tank is constructed from a foundation plate which has a flat lower face and a concave upper face and contains a series of hollow cells, a cupola mounted on the foundation plate to form a spheroidal chamber, and extensible-retractable tie members connecting the cupola with the foundation plate. An expansible separating wall extends across the chamber and divides it into a lower sub-chamber and an upper sub-chamber. Each sub-chamber is provided with a valved duct so that water may be permitted to flow into or out of the lower sub-chamber and oil may be permitted to flow into or out of the upper sub-chamber.



3,944,019

**DEEP WATER SOUND IMPLODER**

Joseph Pauleitich, 91-18 43rd Ave., Elmhurst, N.Y. 11373

Filed June 20, 1974, Ser. No. 481,068

Int. Cl.<sup>2</sup> G01V 1/04

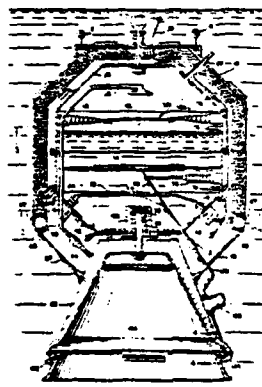
U.S. Cl. 181-120

8 Claims

**Keywords:** Seismic implosive acoustic transmitter

U.S. Cl. X.R. 181-115

An underwater sound imploder adapted for use in the exploration of minerals existing under the sea bed. The imploder consists of three main units, a boiler, a heat shield therefor and a bell shaped sonic device to which the boiler has delivered superheated steam. Expansion of the steam under water pressure causes the implosion. The steam condensate is pumped back into the boiler where it is recycled. The implosions occur repeatedly in the device thereby causing a succession of sonic impulses to pass through the water medium and return as echoes for detection and analysis to determine thereby the character of the reflecting object in the sea bed.



MARCH 23, 1976

3,945,137

**BRAKE FOR CUSHIONING PENDULUM MOVEMENTS,  
ESPECIALLY FOR GRAB BUCKETS OF  
HYDRAULICALLY OPERABLE EARTH DREDGES**

Heinz Joachim Rüttershoff, Schwelm, Germany, assignor to O  
& K Orenstein & Koppel Aktiengesellschaft, Berlin, Ger-  
many

Filed Nov. 13, 1974, Ser. No. 523,515

Claims priority, application Germany, Nov. 14, 1973,  
2356760

Int. Cl.<sup>2</sup> E02F 5/06

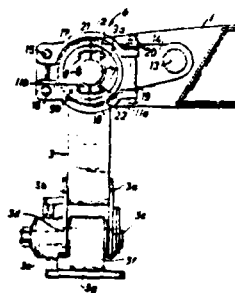
U.S. Cl. 37-183 R

5 Claims

A pendulum brake for cushioning pendulum movements, especially for grab buckets of hydraulically operable earth dredges in which the pendulum brake is arranged at the free end of the shank. A grab bucket holder and a drum are by means of fitting keys non-rotatably connected to a bolt which serves as shaft and is rotatably journaled in bearings at the free end of the shank. The drum cooperates with two clamps provided with brake linings while the clamps embrace the drum and by means of a clamping screw and dish springs exert a pressure upon the drum.

Keywords: Dredge, mechanical

U.S. Cl. X.R. 188-1B; 188-77R; 214-147G



3,945,212

**ARRANGEMENT IN OR RELATING TO CAISSONS OR  
THE LIKE**

Olav Mo, Grønsundveien 94, 1360 Nesbru, Norway

Filed Dec. 5, 1973, Ser. No. 421,794

Claims priority, application Norway, Dec. 5, 1972, 4472/72

Int. Cl.<sup>2</sup> E02D 23/08

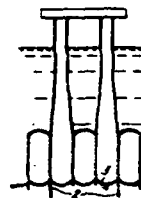
U.S. Cl. 61-46.5

15 Claims

This invention provides a caisson adapted to bear against the sea floor, constructed such that it contacts the sea floor with a minimum of motion. The caisson includes downwardly protruding members which make first contact with the sea bottom, thereby reducing the motion of the caisson by an acceptable level when the more fragile portions reach the sea floor.

Keywords: Offshore caisson; Offshore construction; Offshore platform, fixed; Pile placement; Seabed foundation

U.S. Cl. X.R. 61-50; 61-53.74



3,945,761  
**FAN DISTURBING SAND AT THE BOTTOM OF A BODY  
 OF WATER SO THAT IT MAY BE PUMPED UP  
 EFFICIENTLY**

Toshinobu Araoka, 1308 Orto, Yahata, Kitaky ushu, Fukuoka,  
 Japan

Filed Sept. 2, 1971, Ser. No. 177,893  
 Int. Cl.<sup>2</sup> E02F 3/00

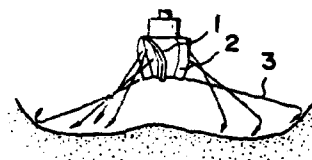
U.S. Cl. 416-188

1 Claim

A fan for use with pumps for pumping up sand from  
 the bottom of a body of water having certain uniquely  
 shaped vanes around the circumference of a truncated  
 cone.

Keywords: Dredge, cutterhead; Dredge intake

U.S. Cl. X.R. 37-67; 37-77; 416-243



MARCH 30, 1976

3,946,568  
**OFFSHORE OIL PRODUCTION PLATFORM**  
 Sigurd Heien, Aslokkvn. 82, 1362 Billingstad, Norway  
 Filed Mar. 24, 1975, Ser. No. 561,376  
 Int. Cl.<sup>2</sup> E02D 21/00; B63B 35/44

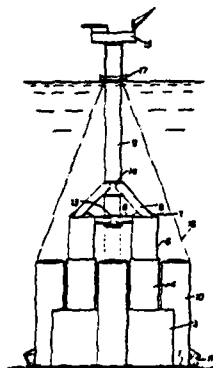
U.S. Cl. 61-46.5

6 Claims

An offshore oil production platform comprising one  
 section disposed on the sea bed and another section  
 connected to the one section and projecting up above  
 the sea surface. The one section consists of a plurality  
 of prefabricated units comprising at least one tank di-  
 vided into a plurality of compartments and having a  
 peripheral wall the thickness of which is not adapted  
 to withstand full water pressure with the tank empty in  
 the submerged state, and at least one compartment in  
 the tank has a peripheral wall the thickness of which  
 is adapted to withstand full water pressure when  
 empty in the submerged state.

Keywords: Offshore platform, fixed; Offshore  
 storage tank, submerged; Seabed  
 oil, process structure

U.S. Cl. X.R. 114-.5T



3,946,686

**BOTTOM-DUMP VESSEL**

Bartele van der Werff, Medemblik, Netherlands, assignor to A. Vuyk & Zonen's Scheepswerven B.V., Capelle an der IJssel, Netherlands

Filed Mar. 28, 1974, Ser. No. 455,733

Claims priority, application Netherlands, Mar. 30, 1973, 7304466

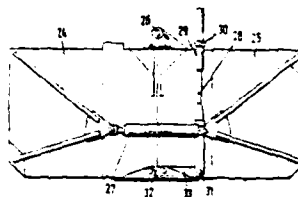
Int. Cl.<sup>2</sup> B63B 35/30

U.S. Cl. 114—29

2 Claims

A bottom-dump vessel, whose longitudinal hull sections can be pivoted apart by jack means to provide an open bottom for discharge of cargo, has the adjoining edges of the keels of the hull sections interconnected by articulated rods which in substantial side-by-side position lock the hull sections in the closed position and in substantial end-to-end position limit the angle of opening of the hull sections. The locking rods have means for positively driving them, thereby allowing for rapidly opening the vessel and transmitting appropriate braking forces to cope with mass forces. The arrangement makes for moderation in the size of jacks and other facilities required.

**Keywords:** Ropper barge



3,946,695

**SELF-DEPLOYING MULTIPLE ANCHOR MOORING SYSTEMS**

Robert D. Isaak, Bellevue, Wash., assignor to Honeywell Inc., Minneapolis, Minn.

Filed Apr. 28, 1975, Ser. No. 572,361

Int. Cl.<sup>2</sup> B63B 21/24

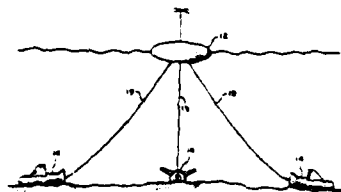
U.S. Cl. 114—206 R

11 Claims

A multiple anchor marine mooring system wherein a plurality of anchors capable of stably gliding through water at a fixed depression once a minimum glide velocity is attained are secured to a carrier in a compact cluster. The cluster is configured so that gravity alone will accelerate it in water to glide velocity, whereupon the anchors are automatically released for self-emplacement.

**Keywords:** Buoy mooring system

U.S. Cl. X.R. 9-8R



3,946,831

# ACOUSTIC TRANSMITTER

John V. Bouyoucos, Rochester, N.Y., assignor to Hydroacoustics Inc., Rochester, N.Y.  
Division of Ser. No. 276,457, July 31, 1972. This application  
May 6, 1974, Ser. No. 466,938  
Int. Cl.<sup>2</sup> H04B 13/02; G01V 1/02

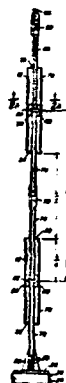
U.S. Cl. 181-120

13 Claims

A transmitter of acoustic energy which propagates that energy in a directional manner is described. An acoustic signal generator is connected at one end of an acoustic transmission line which exhibits a certain characteristic impedance. The line has a number of ports spaced along its length. Surrounding each port is a coupler section which is antiresonant at the driven frequency and which presents a high acoustic driving point impedance to its associated port. In one embodiment, the interior diameter of the line is changed following each port as to make the acoustic pressure along the line and at each port constant, and the acoustic energy radiated in each coupler equal. Accordingly, acoustic energy is partitioned evenly at each port so as to define an array of equal strength radiators having directional acoustic signal propagating characteristics.

Keywords: Instrument deployment; Seismic acoustic transmitter array; Seismic vibratory acoustic transmitter

U.S. Cl. X.R. 181-400; 181-402; 340-RR; 340-5R; 340-384R



3,947,360

# ENVIRONMENT PROTECTIVE OIL SKIMMING AND REMOVAL APPARATUS

Sven Gunnar Fast, Sandviken, Sweden, assignor to Sandco Limited, Ottawa, Canada  
Continuation of Ser. No. 391,554, Aug. 27, 1973, abandoned.  
This application Oct. 21, 1974, Ser. No. 516,763  
Int. Cl.<sup>2</sup> E02B 15/04

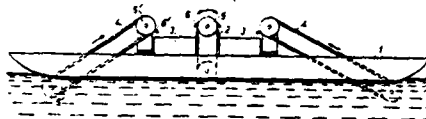
U.S. Cl. 210-242 S

3 Claims

The present invention relates to apparatus for collecting oil or other floating substances from a water surface, comprising a boat having a holding tank and at least one belt conveyor having its lower end submerged and its upper end in communication with the holding tank so that oil or other floating substances are removed from the water and conveyed to the holding tank as the boat progresses through the water.

Keywords: Pollutant, mechanical removal; Pollutant removal watercraft

U.S. Cl. X.R. 210-DIG.25; 210-400; 210-526





APRIL 6, 1976

3,947,980

**PROCESS AND APPARATUS FOR DEEP-SEA PARTICLE HARVESTING**

James E. Andrews, Kailua, and Maurice E. Morgenstein, Kaneohe, both of Kaneohe, Hawaii, assignors to Hawaii Marine Research, Inc., Kaneohe, Hawaii

Filed Feb. 10, 1975, Ser. No. 548,473

Int. Cl.<sup>2</sup> E02F 3/14

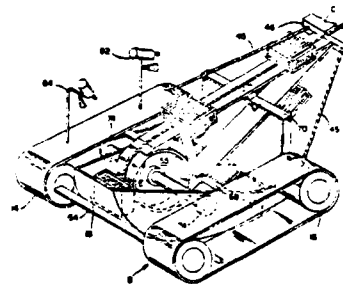
U.S. Cl. 37-69

12 Claims

An apparatus and process for harvesting deep-sea particles, such as nodules, from a substantially planar deep-sea bottom is disclosed. A vessel on the surface tows a heavier than water sled along the ocean bottom. Towing occurs through a single towing strip connected to the sled at the lower end, connected to the vessel at the upper end, and extending angularly downward from the vessel to the sled. The towing strip includes an integral elevator mechanism comprising in the preferred embodiment a series of buckets having perforated sides conveyed by and on an endless belt traveling on the towing strip. The series of buckets on the endless belt empties a concentrator collector having the accumulated and harvested particles in the towed sled. The buckets ride upwardly from the sled to the surface vessel on a first track on the towed strip. The bucket contents are then emptied at the surface typically within the vessel, and thereafter are re-conveyed to the sled on a second and separate track on the towing strip. Thus, a process is disclosed of towing a collector; scraping particles and sediment from the ocean bottom at the collector; concentrating the particles at the collection point interior of the collector, free of ambient sediment; and, continuously conveying in a series of buckets the particles to a collection area above the surface of the sea.

Keywords: Dredge, mechanical

U.S. Cl. X.R. 37-195; 37-DIG.8; 299-18



3,948,056

**MODULAR OFFSHORE STRUCTURE SYSTEM**

Maurice N. Sumner, 1718 Lubbock St., Houston, Tex. 77007

Division of Ser. No. 243,790, April 13, 1972, and a

continuation-in-part of Ser. No. 107,288, Jan. 18, 1971, Pat. No. 3,716,993, which is a continuation-in-part of Ser. No.

649,889, June 29, 1967, Pat. No. 3,575,005. This application

Jan. 8, 1975, Ser. No. 539,302

Int. Cl.<sup>2</sup> E02B 17/00; E02D 25/00

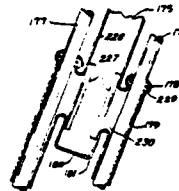
U.S. Cl. 61-46

13 Claims

A modular-like system of offshore structures for imparting flexibility to the offshore exploration and production and transportation industries so that exploration, production and development work can take place over a large range of marine depths and operational circumstances with one or more marine vessels.

Keywords: Offshore construction; Offshore platform, leg; Pile placement; Pile, structure connection

U.S. Cl. X.R. 61-54; 61-69R



296

3,948,058

**DEVICE FOR SOIL SAMPLING UNDER WATER**  
Evgeny Ivanovich Tanov, ulitsa Dzerzhinskogo, 34, and Viktor Yakovlevich Ploschadny, prospekt Svobody, 5, kv. 11, both of Ashkhabad, U.S.S.R.

Filed Oct. 16, 1974, Ser. No. 515,356  
Int. Cl.<sup>2</sup> E02D 1/04

U.S. Cl. 61-63

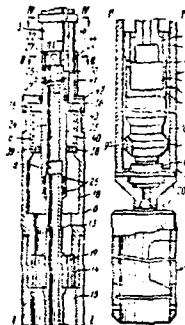
8 Claims

The device features its housing carrying the soil sampling socket and the striker arranged coaxially to said socket, and adapted to act thereupon and establish some chambers in said housing, which are alternatively communicated, through the inlet fitting and the piping connected thereto, with a source of compressed air for the striker to perform forward and return strokes. The piping portion immersed in water is essentially a rigid pipe joined with the inlet fitting by way of an axially spring-loaded sleeve whose one end is rigidly connected to said pipe. Arranged along said pipe is another pipe rigidly coupled thereto and serving for used-up gas to discharge from said chambers to the water surface.

Such a device is applicable for soil sampling at depths amounting to several scores of meters.

Keywords: Sampler, power supply; Sampler, seabed-driven core

U.S. Cl. X.R. 173-91; 173-137; 175-6;  
175-20; 175-100



3,948,203

**MULTIPLE POINT SECURING CLEAT**

Joseph E. Matthews, 4017 N. Witchduck, Virginia Beach, Va.  
23455

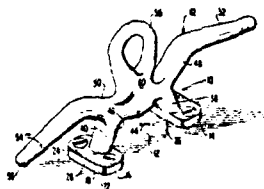
Filed May 9, 1975, Ser. No. 576,185  
Int. Cl.<sup>2</sup> B63B 21/04

U.S. Cl. 114-218

4 Claims

A cleat for multiple point attachment has mounting bases with spaced apart pedestals supporting a main body. The main body includes a central section, and inner and outer wing sections, the main body being of gull wing form. Projecting upwardly from the gull wing main body is an annular peg. Multiple line attachments are facilitated by this arrangement.

Keywords: Small-craft mooring device



APRIL 13, 1976

3,949,496  
WAVE COMPENSATING SYSTEM FOR SUCTION  
DREDGERS

Jan de Konig, 20, Soetendaal, Amsterdam; Romke van der Veen, 21, Prof. Dr. Hesselaan, Jutphaas, and Tjako Aldrik Wolters, 53, Kastanjelaan, Vianen, all of Netherlands  
Continuation of Ser. No. 327,307, Jan. 29, 1973, abandoned.  
This application Sept. 23, 1974, Ser. No. 508,621  
Claims priority, application Netherlands, Jan. 28, 1972, 7201215

Int. Cl.<sup>2</sup> E02F 3/88

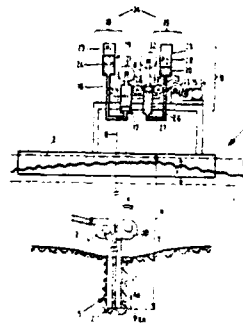
U.S. Cl. 37-58

5 Claims

A suction dredger, comprising a vessel and a suspension conveying conduit provided with a pump and having a nozzle suspended by means of at least one cable of a lifting device on the vessel is improved for preventing breaking of the cable or damage of other dredger parts. To this aim the lifting device comprises a cable length variator delivering cable and each time hauling essentially all delivered cable in work condition with a high cable tension being lower than the inadmissible cable tension, but being higher than a pre-determined low cable tension, in order to prevent an inadmissible cable tension during a downward ground reaction upon the nozzle.

Keywords: Dredge, suction; Dredge ladder control

U.S. Cl. X.R. 37-72; 175-5; 188-314;  
254-172; 254-175.7; 267-125



3,949,497  
RELEASABLE LATCHING APPARATUS FOR A BENTHIC  
GRAB

Ben L. Crump, Freeland, Mich., assignor to Trippensee Corporation, Saginaw, Mich.

Filed Aug. 23, 1974, Ser. No. 500,065

Int. Cl.<sup>2</sup> G01N 1/12; E02F 3/44

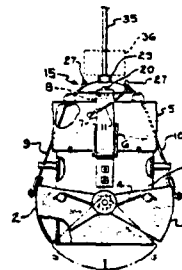
U.S. Cl. 37-71

9 Claims

Releasable latching apparatus for a benthic dredge having closures latchable in open position, the apparatus comprising vertically displaceable latch pins coupled to a plunger which is vertically displaceable by a weighted messenger.

Keywords: Dredge, mechanical; Sampler, seabed grab

U.S. Cl. X.R. 24-205.17; 37-54; 37-56;  
37-183A; 73-425.2; 175-253; 292-246; 294-70



## GRAB BUCKET FOR DREDGING SLUDGE

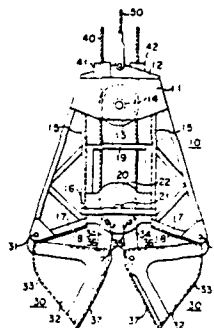
Hisao Iwata; Gentaro Hasewaga, and Kameichi Shimizu, all of Chiba, Japan, assignors to Mitsubishi Seiko Kabushiki Kaisha, Japan

Filed Oct. 30, 1974, Ser. No. 519,120  
Int. Cl.<sup>2</sup> E02F 3/44

U.S. Cl. 37-187

## 5 Claims

A grab bucket particularly suitable for dredging the bottom of the sea, rivers, lakes, etc. is provided with bottom plates at the lower portion of a framework from the bottom of which pivotally hang a pair of bucket shells, whereby the bottom plates cooperate with the bucket shells to shield their upper openings when they are swung upwards about their pivotal portions to put their respective confronting edges tightly together in a conventional manner.



**Keywords:** Dredge, mechanical

U.S. Cl. X.R. 37-71; 294-70

## ACOUSTIC CURRENT/FLOW MEASURING SYSTEM

Lewis A. Stallworth, East Lyme, and Robert R. Hartley, Niantic, both of Conn., assignors to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed July 2, 1974, Ser. No. 485,195  
Int. Cl.<sup>2</sup> G01F 1/66

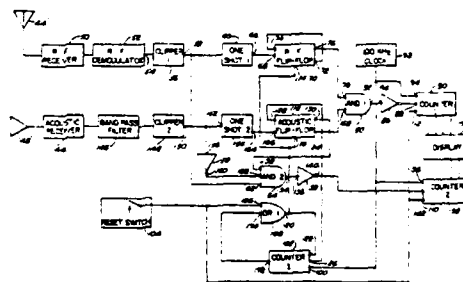
U.S. Cl. 73-194 A

## 6 Claims

A system for measuring flow of water in large bodies of water or in small pipes in which an acoustic signal is transmitted simultaneously via a radio transmitter-receiver system and a projector-hydrophone acoustic system. The electrical and acoustic signals transmitted are received at two preselected locations which are such that they form a right angle triangle with the point of origin of the signals as the vertex of the triangle. The velocity components of the fluid are measured by comparing the delay in time between the transmission of the electrical signal and the acoustic signal started simultaneously from the point of origin. The velocity of the fluid is then determined from the components of the velocity so determined.

**Keywords:** Current measurement

U.S. CL. X.R. 73-170A; 73-189



3,949,697  
**MARINE FENDER ASSEMBLY HAVING A MULTISTAGE  
 SHOCK-ABSORBING PERFORMANCE**  
 Shigeo Ueda, Yokohama, Japan, assignor to Bridgestone Tire  
 Company Limited, Tokyo, Japan  
 Filed Dec. 27, 1974, Ser. No. 536,780  
 Claims priority, application Japan, Dec. 28, 1973, 49-1363  
 Int. Cl.<sup>2</sup> B63B 59/02

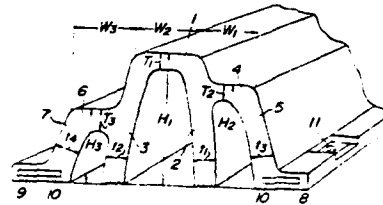
U.S. Cl. 114-219

3 Claims

A marine fender assembly comprises first, second and third shock-receiving members and first, second and third supporting members integrally formed therewith and has an excellent multistage shock-absorbing performance.

**Keywords:** Pier fender

U.S. Cl. X.R. 293-60



3,949,819  
**SOIL SAMPLING DEVICE**  
 Evgeny Ivanovich Tanov, ulitsa Dzerzhinskogo, 34, Ashkhabad  
 Turkmensoi SSR, U.S.S.R.  
 Filed July 10, 1974, Ser. No. 487,393  
 Int. Cl.<sup>2</sup> E21B 25/00, 9/20  
 U.S. Cl. 175-243

3 Claims

A device for taking soil samples from a hole drilled in the ground by another tool, and for drilling shallow holes. The device comprises a pneumatic impact mechanism rigidly connected with a soil sampling socket provided with an appliance for holding the soil sample in the socket when the latter is being extracted from the hole. This appliance is made in the form of an elastic inflatable element which, being inflated with compressed gas, covers completely the inner cross-sectional area of the socket, thus making it possible to take complete and high-quality samples irrespective of the type and condition of the soil.

**Keywords:** Sampler, seabed-driven core

U.S. Cl. X.R. 175-245; 175-250



3,950,030

# UNDERWATER MINING

Barney Girden, P.O. Box 725, Norwich, Conn. 06360  
Continuation-in-part of Ser. No. 285,870, Sept. 1, 1972, which  
is a continuation-in-part of Ser. No. 154,986, June 21, 1971,  
abandoned, which is a continuation-in-part of Ser. No. 41,432,  
May 28, 1970, Pat. No. 3,683,627. This application Aug. 2,  
1974, Ser. No. 494,065  
Int. Cl.<sup>2</sup> E02F 7/05

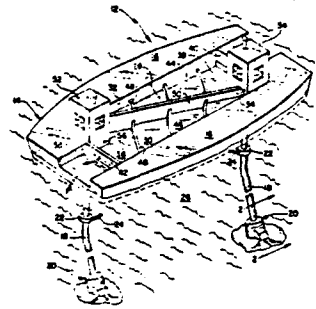
U.S. Cl. 299-9

12 Claims

Methods and apparatus for underwater mining by inducing upwelling of water and entrained minerals or other materials through a conduit from an intake which may move within the body of water by unbalanced forces developed therein by such upwelling to a recovery field which may comprise a vessel floating on the water and which may also be moved by the upwelling water. The outlet of the conduit to the recovery field is positioned below sea level and the velocity of the upwelled water in the recovery field is gradually reduced to induce selective separation of the entrained minerals or other materials.

Keywords: Dredge, suction; Dredge intake

U.S. Cl. X.R. 37-59; 209-458; 209-506;  
302-15



3,950,723

# SONAR APPARATUS

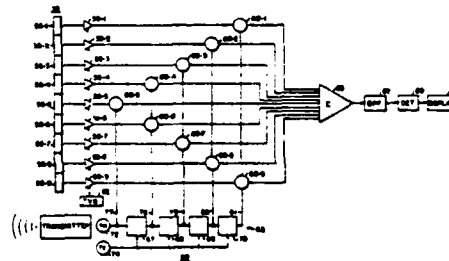
George A. Gilmour, Severna Park, Md., assignor to Westinghouse Electric Corporation, Pittsburgh, Pa.  
Filed Feb. 21, 1974, Ser. No. 444,590  
Int. Cl.<sup>2</sup> G01S 9/68

U.S. Cl. 340-3 R

12 Claims

A high resolution side-looking sonar system wherein the focus is electronically varied with range such that any and all returns are in focus. Focusing is accomplished by time varying phase cancellation, the apparatus additionally forming multiple receiver beams for increasing search rate.

Keywords: Sonar, side looking



APRIL 20, 1976

3,950,805

**COMBINATION PROVIDING SAFETY BERTHING,  
UNLOADING OF OIL, AND CONDUIT CARRIAGE TO  
REFINERIES ON LAND, OF LARGE  
DEEP-SEA-REQUIRING TANKERS**

Christopher J. Murphy, Douglaston, N.Y., assignor to Parson,  
Brinkerhoff, Quade & Douglas, Inc., New York, N.Y.

Filed Jan. 14, 1974, Ser. No. 432,857

Int. Cl.<sup>2</sup> B63B 21/52

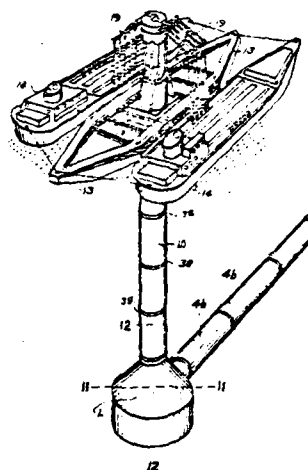
U.S. Cl. 9-8 P

6 Claims

A subaqueous conduit extends from a mainland terminal and leads to the base of a tubular mooring stanchion which extends above the sea surface. The base of the stanchion is located at a depth of up to 100 fathoms adapting the stanchion for the mooring of very large oil tankers. Secured to the stanchion is a double floating pontoon structure to which tankers can berth. The tankers are moored alongside the pontoon structure and discharge their oil through swivel-jointed tubes at the upper portion of the stanchion which permit relative motion of the tanker caused by sea conditions. The pontoon structure can be ballasted to submerge the same to a predetermined depth during adverse weather conditions. The stanchion may receive oil from two tankers simultaneously and is adapted for connection to a plurality of submarine conduits by which oil from the stanchion may be received at a plurality of land-based reception points.

Keywords: Offshore, mooring structure;  
Offshore platform, fixed; Pile  
driver, water jet; Seabed  
foundation

U.S. Cl. X.R. 61-46.5



3,950,953

**PILING FENDER**

Joseph E. Matthews, 4017 N. Witchduck, Virginia Beach, Va.  
23455

Filed Nov. 18, 1974, Ser. No. 525,025

Int. Cl.<sup>2</sup> B63B 59/02

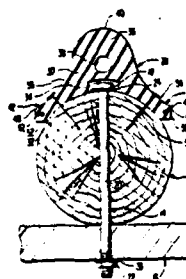
U.S. Cl. 61-48

1 Claim

A piling fender is formed of non-rigid materials and has an inner face shaped for engagement against the piling and an opposite outwardly extended crown. A bore is formed within the fender behind the crown to permit compression. Outwardly extended wing flaps have projecting corners and the outer surface of the fender is concave between the crown and the projecting corners. Fasteners are extended through the wing flaps between the crown and the projecting corners.

Keywords: Pier fender; Pile protection

U.S. Cl. X.R. 114-219



3,950,954

**METHOD AND APPARATUS FOR APPLYING LOADS TO PILES DRIVEN UNDER WATER**

Stanley C. Haug, Brooklyn, N.Y., assignor to Raymond International, Inc.

Filed Dec. 20, 1974, Ser. No. 535,084

Int. Cl.<sup>3</sup> E02D 7/20; E02B 17/00

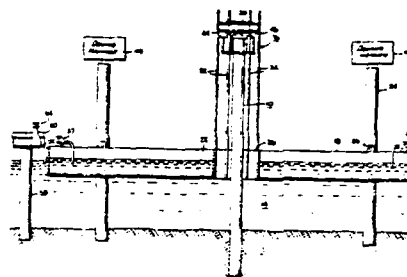
U.S. Cl. 61-53.5

12 Claims

A pile loading system for piles which are driven into the earth under a body of water wherein a buoyant vessel such as a barge or system of barges, is pinned to at least one spud positioned in the earth below the water and a rigid jacking frame is mounted on the vessel to extend above a pile. The vessel is ballasted, as by flooding, to impose a compressive load on the spud and a jack is then positioned between the pile and the frame and is actuated to transfer the load from the spud to the pile. The load may be applied for the purpose of testing the pile or for driving it further into the earth.

Keywords: Offshore construction; Pile load measurement

U.S. Cl. X.R. 61-46.5; 61-63



3,951,087

**BOAT DRY DOCKING APPARATUS**

Bobbie D. Carson, 2300 S. Gessner No. 202, Houston, Tex. 77042

Filed May 2, 1975, Ser. No. 573,976

Int. Cl.<sup>3</sup> B63C 1/6

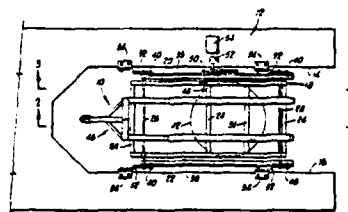
U.S. Cl. 114-45

6 Claims

The present invention relates to a boat dry docking apparatus for installation in a boat dock having substantially parallel sides. An elongated frame is provided adapted to be disposed horizontally in the boat dock and a boat supporting cradle and flotation tank are mounted on the frame. A pair of spaced apart arm members are pivotally attached at the lower ends thereof to each side of the frame and bolts are connected to the upper ends of the arm members for pivotally connecting the upper ends to the sides of the boat dock. The arm members are of a length such that when the bolts for pivotally connecting the upper ends thereof to the dock are attached to the dock in a manner whereby the upper pivotal connections of the arm members are positioned substantially vertically above the lower pivotal connections to the frame, the frame is free to swing between a lower horizontal position beneath the water level in the boat dock whereby a floating boat can be positioned above the boat cradle and an upper horizontal position whereby the boat cradle is above the water level. An air blower and connecting conduit for selectively filling the flotation tank with air are provided to raise the frame to the upper position or exhausting air therefrom to lower the frame to the lower position.

Keywords: Small-craft service structure

U.S. Cl. X.R. 61-65; 214-1A





3,951,231

SEISMIC EXPLORATION

Willie Burt Leonard, 5902 Royalton, Houston, Tex. 77036  
Continuation of Ser. No. 521,966, Nov. 8, 1974, which is a  
continuation of Ser. No. 338,306, March 5, 1973. This  
application Dec. 24, 1974, Ser. No. 536,237  
Int. Cl.<sup>3</sup> G01K 10/00

Keywords: Seismic explosive acoustic  
transmitter

U.S. Cl. X.R. 181-118; 131-120

U.S. Cl. 181-140

16 Claims

A marine acoustic seismic generator carried on the deck of a boat is coupled to a body of water in which the boat floats by a column of water in a pipe extending between the generator and the body of water. Post explosion oscillations are damped or terminated by venting the pipe of gas, either through an orifice or a valve, at a selected time, to a selected pressure, to the atmosphere or below water.



3,951,810

OIL SKIMMER MODULE WITH FREE FLOATING WEIR TROUGH

Angelo J. Crisafulli, Box 1051, Glendive, Mont. 59330  
Division of Ser. No. 330,079, Feb. 6, 1973, Pat. No. 3,822,789,  
which is a continuation-in-part of Ser. No. 142,282, May 11,  
1971, Pat. No. 3,756,414, This application June 27, 1974, Ser.  
No. 483,905

Keywords: Pollutant collection; Pollutant  
removal watercraft; Pollutant,  
suction removal

U.S. Cl. X.R. 210-DIG.25

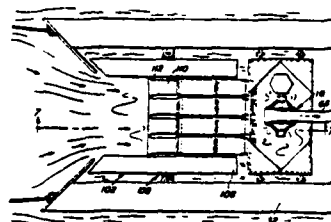
The portion of the term of this patent subsequent to July 9,  
1991, has been disclaimed.

Int. Cl.<sup>2</sup> E02B 15/04

U.S. Cl. 210-242 S

7 Claims

A skimmer for removal of a layer of oil or other floating pollutants from the surface of a body of water incorporating a sump box having a pump disposed therein for conveying material from the sump box into a floating barge, vessel or other area. A free floating weir forming means is disposed forwardly of the sump box and connected and communicated therewith in such a manner that the weir forming means may vary in elevational relation to the sump box without the sump box being elevationally varied in relation to the surface of the water. The weir forming means is supported by float means which orients the weir of the weir forming means in desired relationship to the surface of the water.



3,952,281  
METHOD OF MARINE REFLECTION-TYPE SEISMIC  
EXPLORATION

Alvin L. Parrack, Bellaire, Tex., assignor to Texaco Inc., New York, N.Y.

Continuation of Ser. No. 309,315, Nov. 24, 1972, abandoned.

This application June 10, 1974, Ser. No. 477,554

Int. Cl.<sup>2</sup> G01V 1/38

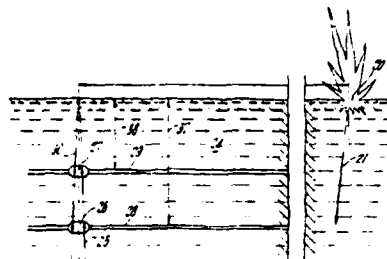
U.S. Cl. 340—7 R

4 Claims

Seismic exploration method applicable to marine surveys. It involves making a dual spread of detectors which are spaced apart vertically. The signals received at the uppermost spread are delayed sufficiently to make downgoing energy signals in time coincidence with downgoing energy signals from the lower spread. Then the signals from both spreads are algebraically combined so as to cancel downgoing energy signals only.

Keywords: Seismic survey method

U.S. Cl. X.R. 340-15.5MC; 181-112



APRIL 27, 1976

3,952,349  
VARIABLE BUOYANCY DEVICE

Robert L. Erath, Seaford; Mathias A. Speidel, St. James, and Edward J. Kennelly, Bayport, all of N.Y., assignors to Grumman Aerospace Corporation, Bethpage, N.Y.

Filed Nov. 18, 1974, Ser. No. 524,950

Int. Cl.<sup>2</sup> B63G 8/14

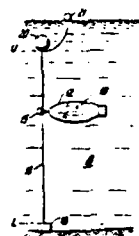
U.S. Cl. 9—8 R

23 Claims

A variable buoyancy device for automatically cycling an object between upward and downward limits including a regulator valve, inflatable device, deep dive control system, shallow dive control system, differential pressure valve, and weight compensating mechanism, as desired, all coacting to automatically cycle the variable buoyancy device between upper and lower depth limits corresponding to predetermined sea water pressures.

Keywords: Buoy, instrumented; Instrument deployment

U.S. Cl. X.R. 73-170A; 114-162



3,952,520

# SHORELINE RETAINING WALL

Thomas H. Shillingford, 26 Underhill Drive, Suite 709, Don Mills, Ontario, Canada

Continuation-in-part of Ser. No. 453,693, March 22, 1974, abandoned. This application Apr. 28, 1975, Ser. No. 572,261 Int. Cl.<sup>2</sup> E02B 3/04

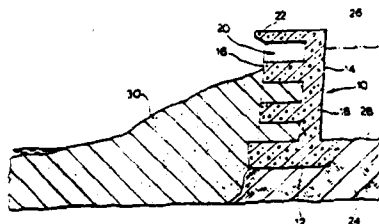
U.S. Cl. 61—4

8 Claims

A retaining wall for use in stabilizing shoreline erosion. An upright wall portion, standing on a footing, carries a pattern of recesses in its front face extending the length and height of the wall portion. Preferably the recesses are rectangular in lateral cross-section and are located in the front face of the wall portion in a staggered grid pattern.

Keywords: Seawall

U.S. Cl. X.R. 61-49



3,952,521

# PORTABLE FLOATING WAVE TRIPPER

John M. Potter, 1828 S. Woodhouse Road, Virginia Beach, Va. 23454

Filed Oct. 29, 1974, Ser. No. 518,541

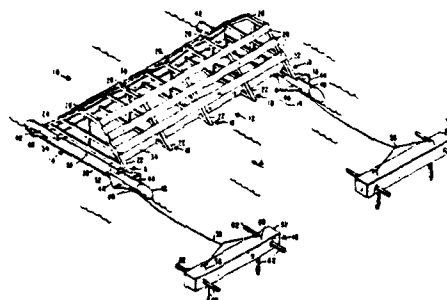
Int. Cl.<sup>2</sup> E02B 3/06

U.S. Cl. 61—5

5 Claims

A floating breakwater or wave tripper supported by pontoons or floats is disclosed. The breakwater is useable for moderating waves and for creating a generally calm surface on the water behind the breakwater. Since the device is carried by floats or pontoons, it is portable and may be moved and positioned as desired. The pontoons or floats which support the breakwater are so shaped that the device cuts through waves striking it instead of floating over them, and is therefore more effective in reducing the height of incident waves than are prior devices which float on the surface of the wave. Suitable anchors are provided to secure the device in a desired location and a plurality of wavebreakers may be joined together to form a portable breakwater of generally any desired length.

Keywords: Breakwater, floating; Breakwater, steel frame



3,952,527

# OFFSHORE PLATFORM FOR ARCTIC ENVIRONMENTS

Edward R. Vinieratos, Oxnard, Calif.; Robert E. Levien, Seattle, and Frank W. Purdy, Lynnwood, both of Wash.

Continuation of Ser. No. 313,862, Dec. 11, 1972, abandoned.

This application Nov. 11, 1974, Ser. No. 522,776

Int. Cl.<sup>2</sup> E02B 15/02; F24J 1/00; F25D 23/12

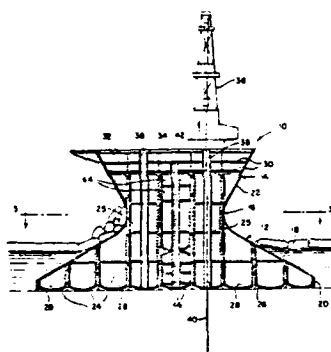
U.S. Cl. 61-46.5

15 Claims

Offshore platform for resisting the pressure of external ice formations in which the base is generally frusto-conical having upwardly and inwardly sloping surfaces. The upper part of the structure is an inverted cone frustum with upwardly and outwardly sloping surfaces to deflect the ice as it rides up and base. The waist surface is rounded. The interior of the platform is formed of vertical tubes which are filled with frozen hard material to assist the structure in resisting external forces.

Keywords: Ice protection; Offshore platform, fixed; Offshore structure fender; Ice structure

U.S. Cl. X.R. 61-1R; 62-259; 165-47



3,952,528

# BOAT DOCK STRUCTURES

Arie Donkersloot, P.O. Box 50, St. James, Fla. 33956

Continuation-in-part of Ser. No. 335,710, Feb. 26, 1973, This

application Mar. 28, 1974, Ser. No. 455,736

Int. Cl.<sup>2</sup> E02B 3/20

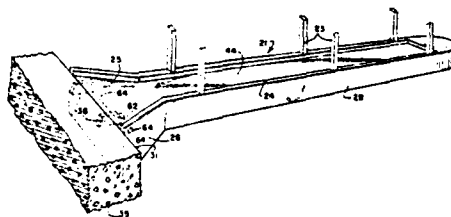
U.S. Cl. 61-48

17 Claims

A boat dock structure horizontally suspended on the edge of a shore of a body of water in a cantilever mode. Guard rail stanchions are fastened onto the top of the dock structure so that no part of the dock is in contact with the water. The dock structure may be connected to a pillar assembly which is adjustable in height.

Keywords: Pier, fixed; Small-craft pier

U.S. Cl. X.R. 14-71R; 248-354R



3,952,532

**UNDERWATER TRENCHING AND CABLE LAYING  
APPARATUS**

Robert R. Spearman, 2367 Bay Circle, Lake Park, Fla. 33410  
Filed Apr. 23, 1975, Ser. No. 570,945

Int. Cl.<sup>7</sup> E02F 5/02, B63B 35/04

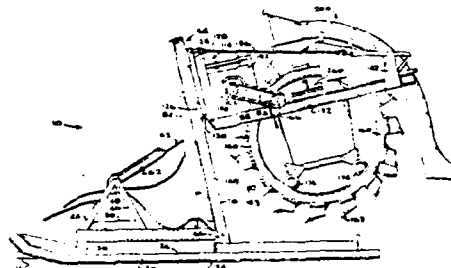
U.S. Cl. 61-72.4

11 Claims

A sled supports a hydraulic motor drive digging wheel in the bottom of a body of water with a cable guide conduit feeding cable into the trench behind the wheel; hydraulic cylinders adjust the depth of the trench with all means being controlled from a support barge or the like providing hydraulic power and control fluid.

Keywords: Seabed cable plow; Seabed trencher

U.S. Cl. X.R. 37-83; 37-139; 61-72.6



3,952,832

**PULSED HIGH PRESSURE LIQUID PROPELLANT  
COMBUSTION POWERED SEISMIC SOURCES**

Lester C. Elmore, Portola Valley, and Thomas M. Broxholm, Palo Alto, both of Calif., assignors to Pulsepower Systems, Inc., San Carlos, Calif.

Division of Ser. No. 869,660, Oct. 27, 1969, Pat. No. 3,620,313. This application Mar. 29, 1971, Ser. No. 129,208  
Int. Cl.<sup>7</sup> G01V 1/06

U.S. Cl. 181-116

5 Claims

A liquid propellant is burned in the bulk mode and in pulses to produce high combustion pressures with large power outputs. The pulsed high pressure liquid propellant combustion is also used for producing sound waves for underwater seismic exploration. The high combustion pressures produced by burning the liquid propellant in the bulk mode and in pulses may be used to overcome high back pressures such as those existing at deep drilling depths and in deep ocean depths.

Keywords: Seismic explosive acoustic transmitter

U.S. Cl. X.R. 340-12R; 340-17R



3,952,833

**METHOD AND APPARATUS FOR GENERATING  
PRESSURE WAVES IN WATER BY IMPLOSION**

Dale H. Reed, and Alpheus A. Franklin, both of Dallas, Tex.,  
assignors to Atlantic Richfield Company, Los Angeles, Calif.

Filed Dec. 26, 1974, Ser. No. 536,356

Int. Cl.<sup>2</sup> G01V 1/38; G01K 1/100

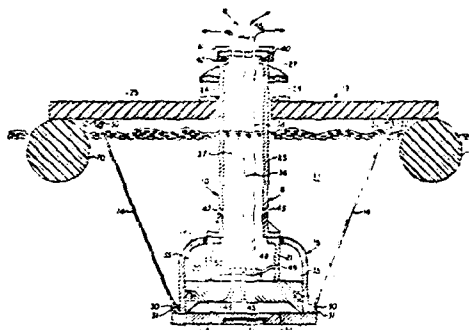
U.S. Cl. 181-118

18 Claims

A gas exploder consisting of a rigid cylindrical lower member and a rigid upper member telescoping therein to form a chamber in which a gas explosion can take place is supported beneath the surface of the water from a float by means of low resilience ropes connected to the bottom of the lower member so as to substantially limit its allowable downward movement. The upper member includes a piston downwardly biased within the lower member by an air spring and a hollow pedestal connected to the piston and extending freely through the float above the surface of the water to accommodate fuel, compressed air and exhaust conduits communicating with the interior of the housing. The energy of an explosion in the combustion chamber is expended primarily through rapid upward movement of the piston, which compresses the air spring and then lifts the lower member. Implosion of the resultant cavitation bubble adjacent the bottom surface of the lower member generates a pressure pulse of large peak amplitude.

Keywords: Seismic implosive acoustic transmitter

U.S. Cl. X.R. 181-120; 181-114; 340-17R



3,953,826

**SUPER LONG SEISMIC SOURCE**

Dennis R. Brundrit, Calgary, Canada, and Jacobus C. van Wijn, The Hague, Netherlands, assignors to Shell Oil Company, Houston, Tex.

Continuation of Ser. No. 446,193, Feb. 25, 1974, abandoned.

This application May 15, 1975, Ser. No. 577,575

Claims priority, application Canada, Mar. 8, 1973, 165556

Int. Cl.<sup>2</sup> G01V 1/02, 1/13

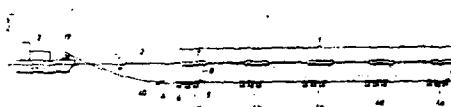
U.S. Cl. 340-7 FC

12 Claims

An elongated seismic source for use in marine seismic explorations consisting of individual seismic sources with one or more sources being grouped in an array. A number of arrays are used with each array being individually supported in the water and coupled by a separate cable to a vessel. The cables are arranged for towing the arrays in a straight line while the vessel contains means for individually controlling the length of the cables.

Keywords: Seismic acoustic transmitter array; Tow winch control

U.S. Cl. X.R. 340-3T; 340-8S; 340-9; 181-120



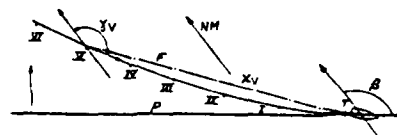
3,953,827  
**METHOD OF DETERMINING THE ANGULAR POSITION  
 OF A TOWED MARINE SEISMIC CABLE AND  
 APPARATUS FOR CARRYING OUT SAID METHOD**  
 Robert Le Moal, Louveciennes; Jacques Cholet, L'Etang-La-  
 Ville, and Daniel Saussier, Elisabethville-Epone, all of  
 France, assignors to Entreprise de Recherches et d'Activites  
 Petrolieres (E.R.A.P.), Paris, France  
 Filed Feb. 19, 1974, Ser. No. 443,251  
 Claims priority, application France, Feb. 21, 1973,  
 73.06123

Int. Cl.<sup>2</sup> G01V 1/00  
 U.S. Cl. 340-7 R 11 Claims

A method and apparatus for determining the position of a plurality of seismic echo receivers on a towed cable by interpolating values obtained by measuring, by means of at least one device positioned among said receivers, the angle between the tangent to the cable and a fixed and known direction. The measuring device can also include apparatus for measuring its depth and its distance from a generator of seismic waves. This provides for more effective use of processes which involve the addition of seismic traces in marine seismic prospecting.

Keywords: Seismic record processor; Seismic streamer cable

U.S. Cl. X.R. 340-3T; 340-7PC



MAY 4, 1976

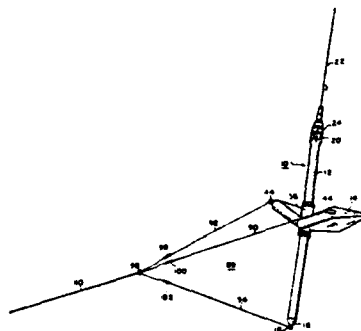
3,953,905  
**STABILIZED, TOWABLE SPAR BUOY**  
 John Lloyd Paitson, Houston, Tex., assignor to Western  
 Geophysical Company of America, Houston, Tex.  
 Filed July 15, 1974, Ser. No. 488,368  
 Int. Cl.<sup>2</sup> B63B 21/52

U.S. Cl. 9-8.3 E 9 Claims

A spar buoy is dynamically stabilized by providing a streamlined, V-shaped wing just above the center of gravity of the spar. The wing has a dihedral sufficient to stabilize the spar in three axes while under tow. The buoy may be equipped with a radio transmitter and a flasher beacon for tracking by an automatic direction finder.

Keywords: Buoy, instrumented; Towed vehicle

U.S. Cl. X.R. 9-8R; 114-235B



3,953,976  
SELF-SUPPORTING WALL

George J. Morren, Ottawa County, and Neil R. Berndt, St. Joseph, both of Mich., assignors to Speidel Foundation & Marine, Inc., Benton Harbor, Mich.

Continuation of Ser. No. 345,492, March 29, 1973, Pat. No. 3,820,343. This application May 20, 1974, Ser. No. 471,497  
The portion of the term of this patent subsequent to June 28, 1991, has been disclaimed.

Int. Cl.<sup>2</sup> E02B 3/04

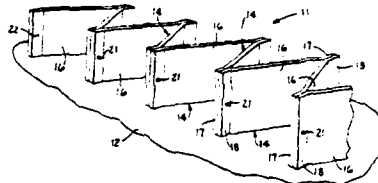
U.S. Cl. 61-4

8 Claims

A self-supporting wall construction comprising a plurality of V-shaped modules connected together to form a zig-zag shaped wall. Each module comprises a pair of wall segments which extend at an angle relative to one another and have their adjacent ends connected together. The pair of wall segments of each V-shaped module are connected by a substantially horizontal hinge, and the adjacent modules are similarly connected by horizontal hinges whereby the individual wall segments are permitted to vertically pivot relative to one another to conform to an unlevel supporting surface. This hinging movement also enables the individual wall segments to relatively move as required by the external loads imposed thereon.

Keywords: Breakwater, concrete; Groin; Low-cost shore protection; Seawall

U.S. Cl. X.R. 61-5



3,953,977  
DEVICE FOR DAMPING WAVES

Keizo Kikui, Kamagaya, and Michio Sasaki, Funabashi, both of Japan, assignors to Mitsui Shipbuilding and Engineering Co. Ltd., Tokyo, Japan

Filed July 11, 1974, Ser. No. 487,646

Claims priority, application Japan, July 16, 1973, 48-80170

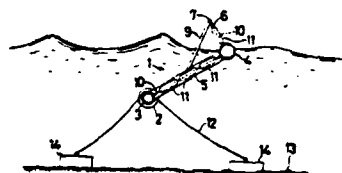
Int. Cl.<sup>2</sup> E02B 3/06

U.S. Cl. 61-5

2 Claims

A device for damping waves comprising an inclined frame having a plurality of barriers and moored to the sea bottom so as to be downwardly sloped against the wave in the sea water, and an upright frame having a plurality of barriers provided on the upper end of said inclined frame and perpendicular to the plane of the inclined frame.

Keywords: Breakwater, floating; Breakwater, steel frame; Tires





3,953,980

**DOCK STRUCTURE**

Gerald B. Bennett, Clarkston, Mich., assignor to Floyd William Bennett, Clarkston, Mich.

Filed Jan. 13, 1975, Ser. No. 540,725

Int. Cl.<sup>2</sup> E02B 3/20

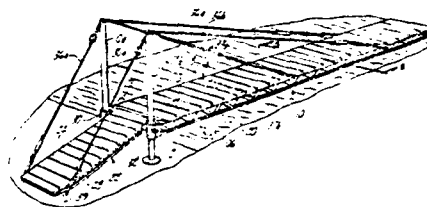
U.S. Cl. 61-48

8 Claims

The dock includes a pair of substantially vertical support members having a vertically adjustable collar mounted on each. The deck portion of the dock has one end attached to the pair of adjustable collars and the other end supported through at least one pair of cables, each attached proximate the free end of the deck member and passing over a V-way at the top of the respective vertical support member with its other end finally anchored to the ground inland of the shoreline. The dock is thus vertically adjustable by means of the cables and collars to accommodate to the height of the changing levels of water. It is furthermore pivotable upwardly from the water surface to avoid damage such as might result in periods of high water or winter ice formation along the shoreline.

Keywords: Pier, fixed; Pier, mobile; Small-craft launcher; Small-craft pier

U.S. Cl. X.R. 14-18; 14-71R; 104-89



3,953,981

**CONNECTING COMPONENTS FOR PILES**

Bengt Axelsson, Norrahammar, and Gunnar Albert Axgarde, Stockholm, both of Sweden, assignors to Parca-Norrahammar AB, Norrahammar, Sweden

Filed May 28, 1974, Ser. No. 474,067

Claims priority, application Sweden, May 28, 1973, 7307486

Int. Cl.<sup>2</sup> E02D 5/34, 7/00

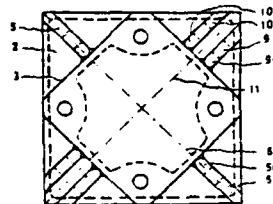
U.S. Cl. 61-53

3 Claims

A concrete pile joint to be used for joining piles by means of complementary joint members, one of which is fastened to the end of a first pile and the other to the end of a second pile. Each joint member has male and female members constituted of rib portions and branches protruding on a support surface of each joint member. By assembling the joint the rib portions are received within the branches and lock pins inserted into coaxial through holes in both the rib portions and the branches for securing each pair of male and female member.

Keywords: Pile, concrete; Pile section connection

U.S. Cl. X.R. 403-336



MAY 11, 1976

3,955,294  
**ELEVATOR APPARATUS FOR TOWED DEEP-SEA  
PARTICLE HARVESTER**

Maurice E. Morgenstein, Kaneohe, Hawaii, assignor to Hawaii  
Marine Research, Inc., Kaneohe, Hawaii  
Filed Feb. 10, 1975, Ser. No. 548,483  
Int. Cl.<sup>7</sup> E02F 3/14

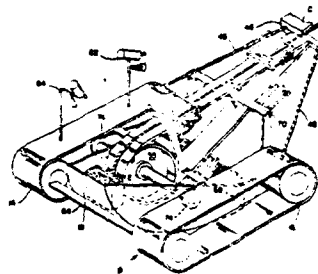
U.S. Cl. 37-69

12 Claims

An elevator apparatus for emptying a towed deep-sea particle harvesting sled is disclosed. The sled is towed over the bottom surface of a deep-sea ocean bed by a strip. The strip is connected at its lower end to the sled, at its upper end to the vessel, and is under tension between the sled and the vessel as the sled is towed over the ocean floor. The strip includes a first railway for passing downwardly sequentially conveyed buckets on an endless belt from the surface vessel to the sled, and a second railway for passing upwardly sequentially conveyed buckets from the sled to the vessel. At the sled, the buckets are reversed on a wheel. The buckets pass through an area wherein collected particles are accumulated with the result that the buckets capture the particles and elevate them along the strip to the surface. At the surface on the vessel a similar wheel reverses the path of the conveyed buckets, as well as emptying the buckets into a surface collection area which is preferably on the vessel. The strip includes spaced apart cable members which are clamped between discrete sections of neutrally buoyant track. These sections of neutrally buoyant track provide an enclosed path for a cable drawing the buckets. This enclosed path is penetrated by a grip fastening the buckets to the moving endless belt. Thus, the cable not only moves the individual buckets, but additionally assures that the buckets are held to their railways on the towing strip.

Keywords: Dredge, mechanical

U.S. Cl. X.R. 37-DIG.8; 37-71; 198-109;  
198-116; 299-9



3,955,372  
**METHOD OF INSTALLING A FIXED MARINE  
PLATFORM WITH DISPERSED BASE**

Ivo C. Pogonowski, Blacksburg, Va., and Paul D. Carmichael,  
Houston, Tex., assignors to Texaco Inc., New York, N.Y.  
Division of Ser. No. 390,805, Aug. 23, 1973. This application  
Dec. 30, 1974, Ser. No. 537,161  
Int. Cl.<sup>3</sup> E02D 21/00

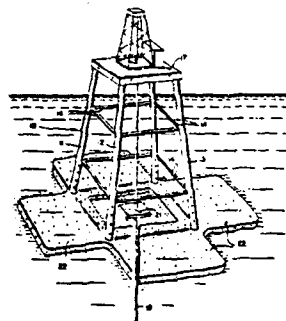
U.S. Cl. 61-46

2 Claims

A method for fixedly positioned marine platform held at the ocean floor by piles and the like, having a relatively flat concrete apron disposed about the platform lower end and also supported on the ocean floor. The apron functions to stabilize the platform against lateral forces caused by water and wave motion, and also avoids scouring which would otherwise occur about the platform legs and piles due to movement of water along the ocean floor. The apron further lowers the center of gravity of the structure and improves its resistance to vibrations and resonance effects due to wave motion.

Keywords: Concrete form; Fabric mat; Offshore platform, fixed; Seabed foundation; Seabed material placement; Seabed scour protection

U.S. Cl. X.R. 61-1R



3,955,412

# WATER CURRENT FORCE MEASURING APPARATUS

Shale J. Niskin, 2941 Lucaya St., Miami, Fla. 33133

Filed Apr. 1, 1974, Ser. No. 456,729

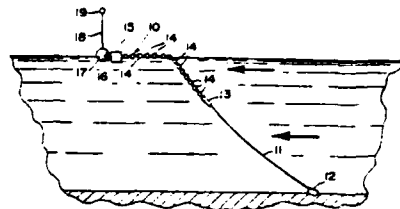
Int. Cl.<sup>2</sup> G01D 3/00; 43 44 98

U.S. Cl. 73-170 A

7 Claims

A water current force measuring apparatus consisting of a pliable rope or line suspended in the water with its lower end anchored to the bottom while the length of the line is subjected to the forces of the current. The upper end of the line is secured to a tensiometer or strain gauge, which in turn is connected to a float or a series of interconnected buoys or floats. Those floats that submerge, balance the total horizontal current-generated force or drag on the line, which is recorded on the tensiometer. These readings are a measure of the total current forces acting on the line by the surface and subsurface currents to permit the ready determination of the total kinetic energy of the currents. Upon obtaining continuous readings of the strain gauge over a definite period, wave heights and lengths, as well as tidal and other cyclic and non-cyclic water movements of the body of water can be ascertained.

Keywords: Buoy, instrumented; Buoy mooring system; Current measurement; Wave measurement



3,955,421

# PERIPHYTON SAMPLER FOR WATER QUALITY MONITORING

Robert J. Doernberg, Earl J. Huddleston, and James F. Mariol, all of Cincinnati, Ohio, assignors to Design Alliance, Inc., Cincinnati, Ohio

Filed Mar. 27, 1975, Ser. No. 562,461

Int. Cl.<sup>2</sup> G01N 1/10

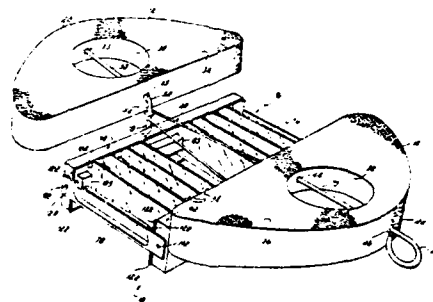
U.S. Cl. 73-421 R

30 Claims

The sampler is intended to hold a plurality of microscope slides which, in use, are disposed just below the water surface. In use, the sampler holds the slides in parallel spaced relation to each other by means of a slide holder which has a pair of oppositely disposed channel-shaped side members that pivot between a slide-holding position whereat the ends of each slide project into the channel and a slide-releasing position whereat each slide can be easily grasped by its edge and removed. The slide holder is held by a wire bail and a retainer clip so that the side members cannot pivot from their slide-holding position thereby preventing the slides from falling from the holder. The bail itself is pivoted to two floatation members and shaped to dispose the slide holder at a location displaced away from the pivot axis through each floatation member thereby making the sampler capsize-proof because the slide holder will pivot to a position below the water surface even if the sampler is turned over. The floatation members are constructed so that little of the sampler is visible to passersby when floating in water.

Keywords: Pollutant measurement; Sampler, biota

U.S. Cl. X.R. 73-421B



MAY 18, 1976

3,956,834  
**DREDGE LADDER SHOCK MOUNTING  
ARRANGEMENTS**

William Andrew McWatters, c/o P. E. Terry Charlton Road,  
East Brookfield, Mass. 01515

Continuation-in-part of Ser. No. 471,897, May 21, 1974,  
which is a division of Ser. No. 195,674, Nov. 4, 1971, Pat. No.  
3,821,859. This application July 25, 1974, Ser. No. 491,659  
Int. Cl.<sup>2</sup> E02F 3/90

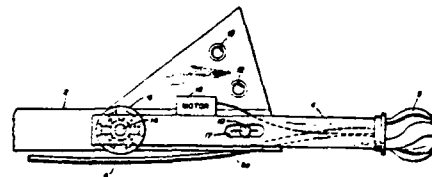
U.S. Cl. 37-72

18 Claims

Dredge ladder shock mounting arrangements for two or more part dredge ladders with a main dredge ladder part pivotally connected at a dredge platform and a secondary dredge ladder part adjustably connected to the main ladder part. The interconnecting systems for connecting the two ladder parts includes a pivot pin for accommodating changes in the angular inclination of the two ladder parts with respect to one another as well as locking members for pivotally locking the ladder parts in predetermined adjusting working positions. Shock mounting devices are interposed between the pivot pin and the two ladder parts so that relative movement of the ladder parts in a direction radially of the pivot pin axis against the shock absorbing forces is permitted. The locking members includes guide pins relatively fixed in position on the main ladder part which slidably and guidingly engage linearly extending guide slots in the secondary dredge ladder parts, such that the secondary dredge ladder part is constrained for movement only along the longitudinal direction thereof during dredging operations. Preferred embodiments also include additional shock absorbing devices interposed at the pivotal connection between the barge and the main dredge ladder part. These arrangements, by accommodating adjustment of the pivot angle of the ladder parts, will accommodate keeping up to 80% of the cutter blades in the bank at all times.

Keywords: Dredge, cutterhead; Dredge ladder control

U.S. Cl. X.R. 37-67; 403-145



3,957,098

**EROSION CONTROL BAG**

George Hepworth, Palm Beach, and Joseph F. Kelly, Miami,  
both of Fla., assignors to Erosion Control Incorporated,  
West Palm Beach, Fla.

Filed June 26, 1972, Ser. No. 266,177

Int. Cl. B65d 33/16

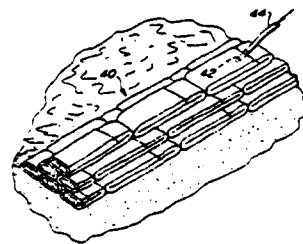
U.S. Cl. 150-9

10 Claims

An erosion control bag of dark-colored fabric for underwater use and light-colored for other use is disclosed having a porosity of 10 to 35 cubic feet per minute so that air and water may escape from the bag as water and a filler are pumped into the bag. The bag has a self-sealing opening so that it can be filled while positioned in situ below water level.

Keywords: Low-cost shore protection; Sandbag; Seabed material placement

U.S. Cl. X.R. 61-37; 150-1; 260-2.5M

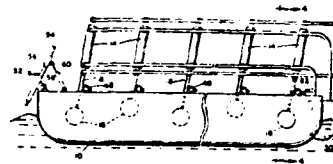


3,957,398  
**WAVE ENERGIZED PUMP**  
 Harold Lloyd, 67 Casselman Place, Chula Vista, Calif. 92010  
 Filed Sept. 3, 1974, Ser. No. 502,283  
 Int. Cl.<sup>2</sup> F04B 17/00, 35/00  
 U.S. Cl. 417—331 4 Claims

This is a floating pumping station, conceived as ordinarily to be used at the shore of the ocean or large lake where wave action is very considerable and where provision must be made for tidal change and in some cases change in the force of the waves since the waves of great amplitude must be refused entry into the apparatus or attenuated. The apparatus comprises, in brief, a pair of elongated pontoons which define a channel therebetween and this channel is guarded at one end at least by the said wave attenuating apparatus, while a plurality of double-acting pumps distributed along the length of the channel operate in response to the movement of floats which are connected to the pistons of the pump. The pumps have their inlets connected to a common filter sump wherein the water level is substantially that of the surrounding sea or lake, and a unique feature of the invention comprises a compartmentation of each pontoon, the compartments being distributed along the length of each pontoon and connected by a common conduit with stub pipes leading into each compartment and valved in such manner that float actuated water level controls in each compartment assure that the pontoons remain stabilized with respect to the water level in the filter sump which is the water level of the surrounding sea or lake.

Keywords: Power, wave; Pump

U.S. Cl. X.R. 60-497; 60-503; 60-505; 60-506



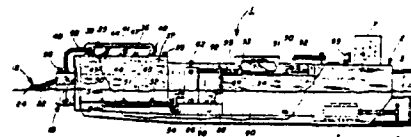
3,957,646  
**INSTALLATION FOR REMOVING POLLUTANTS FROM WATERWAYS**  
 Forrest M. Wickert, 1224 Argyle Drive, North Madison, Ohio 44057  
 Filed Sept. 6, 1974, Ser. No. 503,729  
 Int. Cl.<sup>2</sup> E02B 15/04  
 U.S. Cl. 210—242 S 34 Claims

A floating installation for the recovery of a liquid pollutant, such as petroleum or the like, from navigable waterways, including a main vessel adapted for floating movement in the water. A receiving tank is operably connected to the main vessel, having a scoop hingedly connected thereto for skimming the liquid pollutant from the water surface as the vessel moves relative thereto. The scoop is equipped with buoys for controlling the level of the inlet end of the scoop with respect to the water surface. The opposite or discharge end of the scoop is connected to the receiving tank for discharging the collected liquid pollutant therein. The receiving tank is mounted for movement relative to the main vessel, such that it can float in the water independently of the main vessel. A primary separation means including settling tanks are supported on the main vessel to receive the collected pollutant and for separation of the water collected with

Keywords: Pollutant collection; Pollutant removal watercraft

U.S. Cl. X.R. 210-DIG.25

the pollutant. A secondary separating means is connected to the settling tanks for selectively separating the remaining water from the pollutant after the primary separation and for discharging the water from the vessel while transferring the recovered pollutant to storage tanks for subsequent further refinement and use, as required.



316

MAY 25, 1976

3,958,346

**MULTIPLE PUMPING CHAMBER DREDGING  
APPARATUS**

Giovanni Faldi, Florence, Italy, assignor to Pneuma International S.A., Luxembourg, Luxembourg

Filed July 23, 1974, Ser. No. 490,962

Claims priority, application Italy, July 27, 1973, 27228/73  
Int. Cl.<sup>3</sup> E02F 3/88

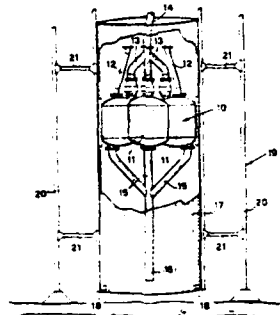
U.S. Cl. 37-59

3 Claims

An improved dredging apparatus comprising a plurality of pumping chambers, each pumping chamber having a separate inlet pipe branched off from a single intake duct, the intake duct in turn being either connected to the dredging shovel or directly adapted to take out samples from an underwater bed, the pumping chambers in operation being cyclically filled with dredged material and emptied by air pressure. The pump body is slidably mounted to a rigid frame structure, whereby the intake duct is surrounded and protected during sampling operations.

Keywords: Dredge, suction; Dredge intake; Pump; Sampler, seabed grab

U.S. Cl. X.R. 417-122



3,958,426

**OFFSHORE HARBOR TANK AND INSTALLATION**

Sigurd Heien, Aslokkveien 82, Billingstad, 1370 Asker, Norway

Filed Feb. 16, 1972, Ser. No. 226,684

Claims priority, application Norway, Mar. 2, 1971, 768/71  
Int. Cl.<sup>3</sup> E02D 7/00

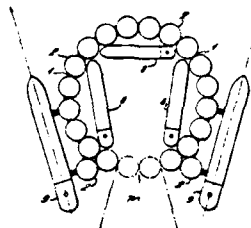
U.S. Cl. 61-46

5 Claims

An offshore harbor and tank installation for oil and gas, comprising a number of steel or concrete caissons floated separately to selected position and interconnected axially and in floating vertical position interconnected radially to desired configuration, and sunk to the ocean floor, the hollow spaces between the adjacent walls of the caissons may be ballasted with sand, gravel or similar material.

Keywords: Breakwater, concrete; Offshore caisson; Offshore harbor; Offshore storage tank, emergent

U.S. Cl. X.R. 61-1R; 61-4; 61-34; 61-46.5; 61-50



3,958,521

**DEEP SEA TANK AND SEAPORT SYSTEM**

Steven J. Memoli, Box 720 N. Vosseller Ave., Martinsville, N.J. 08836.

Filed May 30, 1975, Ser. No. 582,091

Int. Cl.<sup>2</sup> B63B 25/08, 35/32

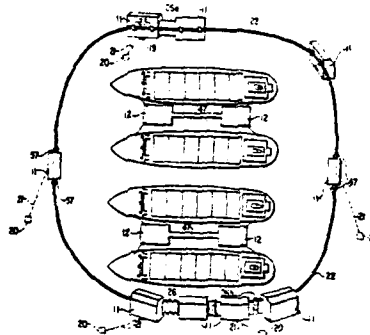
U.S. Cl. 114—5 T

9 Claims

A deep sea tank and seaport system is disclosed. The system includes a plurality of deep sea tanks which provide a containment barrier surrounding one or more towers which function as a decking facility for oil tankers. The deep sea tanks are connected to a cable surrounding the tower, with an opening at either end of the tank arrangement to permit access by the oil tankers to the tower. The tower employs features which ensure a stabilized platform, while allowing easy access to the tankers. The tower is equipped with living and operational spaces for the crew, and a pipeline is provided to allow transfer of oil to the shore. The present system is advantageously employed around oil drilling rigs and in other environments in which it is desired to contain oil spills or other pollutants floating on the water.

Keywords: Offshore mooring structure; Offshore platform, fixed; Pollutant, surface barrier

U.S. Cl. X.R. 61-1F



3,958,647

**POWERFUL SUBMERSIBLE DEEPWATER PILE DRIVER  
POWERED BY PRESSURIZED GAS DISCHARGE**

Stephen V. Chelminski, West Redding, Conn., assignor to Bolt Associates, Inc., Norwalk, Conn.

Filed June 4, 1975, Ser. No. 583,686

Int. Cl.<sup>2</sup> E02D 7/00

U.S. Cl. 173—127

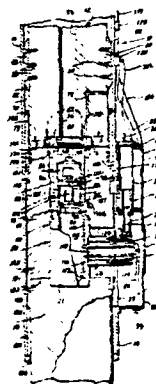
14 Claims

A very powerful pile driver is disclosed capable of operation in the air, partially submerged or totally submerged in the ocean for driving long piles into the ocean floor in deep water construction jobs. The pile driver includes a cylindrical housing, a movable massive weight within the housing, an annular cylindrical thrust-transferring member defining a discharge chamber below this weight, and a movable driving head attached to this annular member, forming a thrust-transmitting assembly adapted to be engaged with the pile. Pressurized gas such as compressed air is discharged from gas discharge apparatus, called an airgun located within the discharge chamber and provides two driving thrusts for each discharge. A cantilevered arm projecting from the gas discharge apparatus extends through and is straddled by an opening in the wall of the thrust-transmitting assembly and supports the cylindrical housing and feeds pressurized gas to the airgun which is temporarily in "floating" relationship during the instants when pile-driving thrusts are being transmitted, said arm engaging shock-absorbing means attached to the housing. Gas purging

Keywords: Offshore construction; Pile driver, impact

U.S. Cl. X.R. 173-131; 173-135

means enable seawater to be purged from the firing chamber of the airgun after the pile driver has initially been lowered into the sea in preparation for operation, and a position-responsive valve may be provided to monitor the operational relationships for protecting the equipment.



3,959,127

# BIODEGRADATION OF OIL ON WATER SURFACES

Richard Bartha, East Brunswick, N.J., and Ronald M. Atlas, Louisville, Ky., assignors to The United States of America as represented by the Secretary of the Navy, Washington, D.C.  
Continuation-in-part of Ser. No. 421,874, Dec. 5, 1973, abandoned. This application Mar. 13, 1975, Ser. No. 558,040  
Int. Cl.<sup>2</sup> C02B 9/02

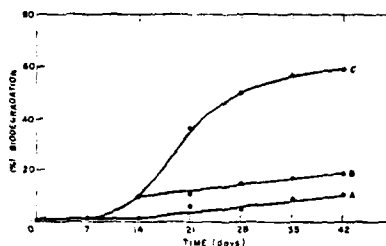
U.S. Cl. 210-11

1 Claim

Free-floating oil slicks on bodies of sea and fresh water are disposed of by microbial degradation at a greatly enhanced rate by applying the essential microbial nutrients, nitrogen and phosphorus, to the oil slick in a form that dissolves in or adheres to the oil and thus selectively stimulates the activity of oil-metabolizing microorganisms.

Keywords: Pollutant dispersion

U.S. Cl. X.R. 71-64F; 195-3R; 210-DIG.27; 210-36; 210-40



3,959,134

# OIL COLLECTION AGENTS AND THEIR USE IN CONTAINING OIL SLICKS

Gerard P. Canevari, Cranford, N.J., assignor to Exxon Research and Engineering Company, Linden, N.J.  
Continuation-in-part of Ser. No. 453,014, March 19, 1974, abandoned. This application Feb. 18, 1975, Ser. No. 550,511  
Int. Cl.<sup>2</sup> C02B 9/02

U.S. Cl. 210-59

13 Claims

Mixtures of C<sub>10</sub>-C<sub>20</sub> aliphatic carboxylic acids or the sorbitan monoesters thereof, sorbitan monoacrylates in combination with nonpolar solvent systems are effective oil collecting agents for containing oil slicks floating on a water surface. The invention, therefore, describes a method whereby oil slicks floating on a water surface may be contracted by applying to the perimeter of the oil slick an effective amount of an oil collection agent as described above, whereby the surface area of said oil slick is reduced. After the size of the oil slick is reduced by means of the oil collection agent, the oil may then be physically removed from the water. An advantage of treating oil slicks in this manner is that the method aids in the removal of the oil completely from the water. The oil collection agents encompassed by the present invention have the additional advantages of having low toxicities as well as pour points low enough to enable their use during operations where water and/or air temperatures are less than 45°F.

Keywords: Pollutant absorption

U.S. Cl. X.R. 210-DIG.27; 252-312

No Figure

319



3,959,136

**OIL SPILL CLEANUP METHOD AND APPARATUS**

Ray R. Ayers, and Dean P. Hemphill, both of Houston, Tex.,  
assignors to Shell Oil Company, Houston, Tex.

Continuation of Ser. No. 289,043, Sept. 14, 1972, abandoned.

This application Sept. 9, 1974, Ser. No. 504,595

Int. Cl.<sup>2</sup> B01D 21/00; E02B 15/04

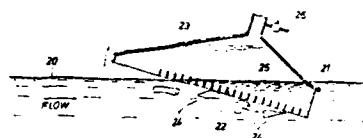
U.S. Cl. 210-83

11 Claims

Method and apparatus for removing oil from the surface of a body of water with a skimmer; the apparatus including a skimmer with baffled entry ports arranged on a plane inclined to the direction of current flow or about the periphery of a drum so that oil enters through the baffles into a chamber which is beneath an inverted funnel or within the axle of the drum; the method involving providing a skimmer having submerged baffle entry ports inclined to the direction of current flow, allowing the oil to enter the skimmer, and returning the skimmer to a horizontal position for removal of the oil therefrom through an inverted funnel suspended over the confined oil.

Keywords: Pollutant, mechanical removal;  
Pollutant removal watercraft

U.S. Cl. X.R. 210-DIG.25; 210-2425



3,959,663

**TIDE-POWERED ELECTRICAL GENERATOR**

Joseph V. Rusby, 2230 Granada Drive, South Daytona, Fla.  
32019

Filed Sept. 19, 1974, Ser. No. 507,289

Int. Cl.<sup>2</sup> F03B 13/12

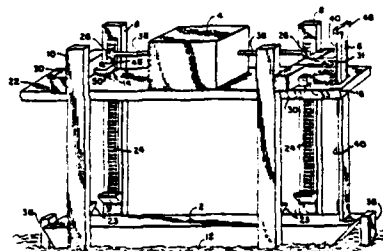
U.S. Cl. 290-53

10 Claims

A tide-powered electrical generator wherein the energy from successive rising tides is stored in the form of potential energy for selective conversion to electricity. A float is constrained to vertical motion and it raises on successive tides a weight by means of a jack bar to reach a maximum predetermined height on a stable support structure where the weight is supported until release for the generation of electricity. Provision is made for the prevention of damage to the generator by excessive tidal rises.

Keywords: Electrical generator; Power, tide

U.S. Cl. X.R. 60-497; 417-333



JUNE 1, 1976

3,959,898

**DREDGE LADDER SHOCK MOUNTING ARRANGEMENT**

William Andrew McWatters, c/o P. E. Terry, Charlton Road,  
East Brookfield, Mass. 01506

Division of Ser. No. 195,674, Nov. 4, 1971, Pat. No. 3,821,859.  
This application May 21, 1974, Ser. No. 471,897. The term  
of this patent subsequent to July 2, 1991 has been disclaimed.

Int. Cl.<sup>2</sup> F02F 3/90; F16F 9/00

U.S. Cl. 37-72

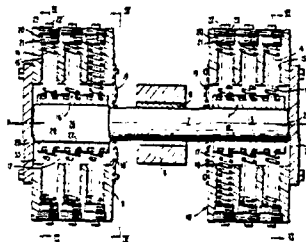
15 Claims

Shock mounting arrangements for mounting one end of a rigid dredge ladder and for mounting the holding spud on a dredging barge or dredging platform. In the ladder mounting, pivot pins are connected to one end of the ladder for permitting pivotal movement of the ladder thereabout. The pivot pins are supported in rigid housing structures attached to the barge structure. These housing structures include a plurality of coil springs operatively engaging the pins and the rigid housing structure such that the pins are normally held in a fixed position but are permitted limited radial movement in response to dredging operation shock forces transmitted by way of the ladder to the pin means. Guide means can also be provided to limit the motion of the pin means along a single plane extending perpendicularly to the pivot axis of the ladder. Other shock absorbing means, such as hydraulic

Keywords: Dredge ladder control

U.S. Cl. X.R. 37-73; 188-268; 308-26; 403-151

means or rubber means can be substituted for the spring means. One arrangement of the invention provides for mounting the dredge ladder for pivoting movement about an axis at the rear of the barge, while another embodiment provides for pivotally mounting the ladder forwardly of the rear of the barge. In the holding spud mounting, a vertically extending housing is provided with radially extending springs for supporting the holding spud in vertical position with respect to the barge. These springs permit limited radial movement to attenuate shifting shock forces caused by winds and water swells.



3,960,722

**OIL ADSORBENT**

Masami Tomikawa; Akiji Tsunoda; Kazuhisa Kaneda; Hideo Ohkawa, and Yutaka Mugino, all of Chiba, Japan, assignors to Idemitsu, Kosen Kabushiki Kaisha (Idemitsu Kosen Co., Ltd.), Japan

Continuation of Ser. No. 363,389, May 24, 1973, abandoned.

This application Jan. 27, 1975, Ser. No. 544,301

Int. Cl.<sup>2</sup> C02B 9/02

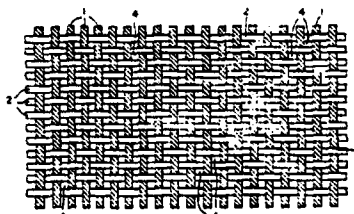
U.S. Cl. 210-36

6 Claims

An oil adsorbent comprising a plastic material for eliminating oils present in or on the surface of water through adsorption. Said adsorbent is produced by foaming by a physical means polyethylene containing 30-80% by weight of at least one inorganic calcium compound selected from the group consisting of calcium sulfite and calcium carbonate, to prepare a foamy substance having a density of 0.06-0.10 g/cc and then shaping the substance to have a network structure.

Keywords: Pollutant absorption; Pollutant, mechanical removal

U.S. Cl. X.R. 210-DIG.26; 210-40; 210-502; 260-2.5HA; 252-428



3,961,303  
**DEPTH CONTROLLERS WITH CONTROLLABLE  
 NEGATIVE AND UNCONTROLLABLE POSITIVE  
 LIFT-PRODUCING MEANS**

John Lloyd Paitson, Houston, Tex., assignor to Western Geophysical Company of America, Houston, Tex.  
 Filed May 8, 1974, Ser. No. 468,129  
 Int. Cl.<sup>2</sup> G01V 1/00

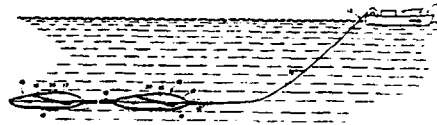
U.S. Cl. 340—7 PC

10 Claims

A depth controller whose streamlined body has only negative variable lift-producing means, such as a pair of vanes that can produce a controllable downward force. Embodied in the controller are also means providing an uncontrollable upward force. The vanes are preferably movable by translation or rotation in a single plane, inclined relative to the horizontal. Depth control means are operatively coupled to retract the vanes inward as the controller moves from the water surface down to a reference depth. The uncontrollable positive lift producing means return the controller to the desired depth should it fall below the reference depth. Each controller can be used to effectively maintain a seismic streamer cable section at or near the desired reference depth.

Keywords: Seismic streamer cable; Towed body depth control

U.S. Cl. X.R. 114-235B



3,961,304  
**DECOUPLED HYDROPHONE WITH REDUCED  
 RESPONSE TO VIBRATION AND STRESS  
 CONCENTRATION**

Henry P. Bakewell, Jr., Old Saybrook, Conn., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Oct. 21, 1974, Ser. No. 516,330

Int. Cl.<sup>2</sup> G01V 1/00; H04B 13/00; H04R 15/00

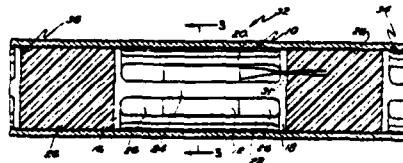
U.S. Cl. 340—7 R

7 Claims

A pressure sensitive hydrophone assembly which provides an undiminished acoustic sensitivity while discriminating against waves induced in the material surrounding the hydrophone elements by flow and/or vibrational excitation. The hydrophone comprises a ceramic element surrounded by a rigid barrier and an elastic material inside the rigid barrier which is constructed to preclude the arrival of undesired forces at the ceramic element.

Keywords: Seismic hydrophone

U.S. Cl. X.R. 340-8LP; 340-10



JUNE 8, 1976

3,961,389

**DEPTH REGULATING APPARATUS**

Clark W. Dovel, Potomac; Frank Peregrin, Silver Spring, and Daniel R. Tolliver, Laurel, all of Md., assignors to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Sept. 9, 1969, Ser. No. 856,414

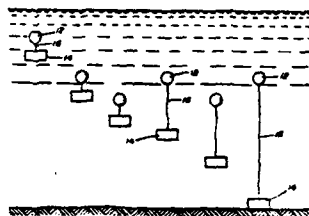
Int. Cl.<sup>2</sup> B63B 21/52

U.S. Cl. 9—8 R

4 Claims

Apparatus for automatically controlling the mooring depth of a submerged buoyant body secured to an anchor by a mooring line contained within the anchor having a power supply, a first potentiometer preset to a desired mooring depth and variable with the payout of mooring line, a second potentiometer variable with ambient water pressure for sensing the depth of the anchor, and a null detector connected between the slidable taps of the potentiometers and a mooring line payout control system for actuating the payout control system if there is an unbalance therebetween in one, but only one, direction.

Keywords: Buoy, instrumented; Buoy mooring system



3,961,489

**METHOD FOR PLACING A FLOATING STRUCTURE ON THE SEA BED**

Olav Mo, Gronsundveien 94, Nesbru, 1370 Asker, Norway  
Division of Ser. No. 352,679, April 19, 1973, Pat. No. 3,911,687. This application Oct. 18, 1974, Ser. No. 516,123

Claims priority, application Norway, May 2, 1972, 1541/70

Int. Cl.<sup>2</sup> E02B 17/00

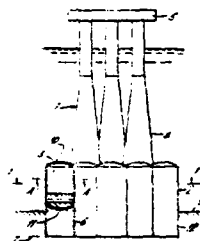
U.S. Cl. 61—46.5

2 Claims

A method of supporting a structure, such as a drilling structure used in offshore oil activities. The structure includes a caisson having at least one ballast cell and a plurality of skirts extending downwardly below the base of the caisson. The skirts define compartments which are open at their lower ends. The structure is floated to a location at sea and is then sunk. Ballast is then introduced into the ballast cell to cause the skirts to penetrate downwardly into deeper layers of sea bed soil. The skirts thus form closed compartments. Sea water trapped within the compartments is then removed and ballast is then removed from the ballast cell to reduce the vertical load on the sea bed to a load level such that the sea bed material does not fail. Movement of the structure is primarily restrained by adherence and friction between the sea bed and the skirts and by temporary pressure differentials within the closed compartments created by partial movement of the structure.

Keywords: Offshore caisson; Offshore construction; Seabed foundation

U.S. Cl. X.R. 61-50



3,961,490

# ANCHORAGE OF FLOATING STRUCTURES

Jean-Louis Corgnet, Boulogne Billancourt, France, assignor to Compagnie Francaise des Petroles, Paris, France

Filed Dec. 23, 1974, Ser. No. 535,920

Claims priority, application Canada, Dec. 21, 1973, 188913; France, Apr. 30, 1974, 74.14934; Nov. 27, 1974, 74.38886

Int. Cl.<sup>2</sup> F02D 21/00; B63B 21/00; B65B 3/04

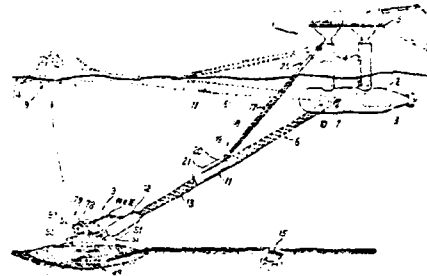
U.S. Cl. 61-46.5

53 Claims

A floating structure is anchored relative to the seabed by a rigid arm connected at one end to the structure and at the other end to a member, preferably in the form of an enclosure and including a watertight chamber for personnel, for pivotal movement about respective horizontal axes; the member is adapted to be releasably connected to an enclosure fixed in the seabed, defines with the enclosure a chamber to be placed at atmospheric pressure and is rotatable about a vertical axis relative to the enclosure. The arm may include damper means, e.g. in the form of a jack or a horizontal articulation of upper and lower arm parts.

Keywords: Offshore platform anchor; Offshore platform, floating

U.S. Cl. X.R. 9-8P; 61-69R; 114-230; 141-279; 141-387



3,961,491

# PILE CONNECTING DEVICE

Anthony Lewis Reddaway, Windlesham, and Frank Edward Young, Sutton Courtenay, both of England, assignors to West's Piling and Construction Company Limited, Great Britain

Filed Mar. 14, 1975, Ser. No. 558,386

Claims priority, application United Kingdom, Mar. 14, 1974, 11427/74

Int. Cl.<sup>2</sup> E02D 5/30; F16B 7/00

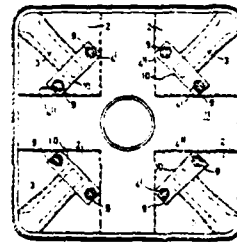
U.S. Cl. 61-56

7 Claims

A pile connecting device having a plurality of plate members each adapted to be secured to the end of a pile section and each having a recess extending inwardly from its periphery, frame means for operatively interconnecting said plate members, a further plurality of plate members each adapted to be secured to the end of a further pile section and each having a recess extending inwardly from its periphery, and a further frame means for operatively interconnecting said further plate members, each plate member prior to connection in with their recess registering, and a longitudinal pin substantially I-shaped in cross-section adapted to be inserted and retained in each pair of registering recesses, the underfaces of the heads of the pin bearing against the outer surfaces of the abutting plate members.

Keywords: Pile, concrete; Pile section connection

U.S. Cl. X.R. 52-726; 52-731; 403-282; 403-294



3,961,593

**DOCK FENDER ASSEMBLY**

Joseph E. Matthews, 4017 N. Witchduck, Virginia Beach, Va. 23455

Filed May 30, 1975, Ser. No. 582,138

Int. Cl.<sup>2</sup> B63B 59/02

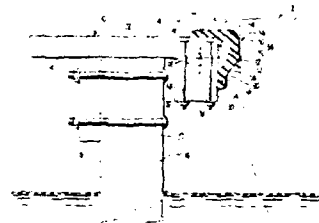
U.S. Cl. 114-219

1 Claim

A dock fender for application to an impact deck with a top and a side has an upper wall attached to the top and a fender portion. An internal lip and a base contact the side, and the fender defines a flexation chamber.

Keywords: Pier fender; Small-craft mooring device

U.S. Cl. X.R. 61-48



3,961,863

**WATER ACTION POWERED PUMP**

Lee Ezekiel Hooper, III, 11 Sandpiper Road, Tampa, Fla. 33609

Filed Jan. 13, 1975, Ser. No. 540,544

Int. Cl.<sup>2</sup> F04B 17/00

U.S. Cl. 417-334

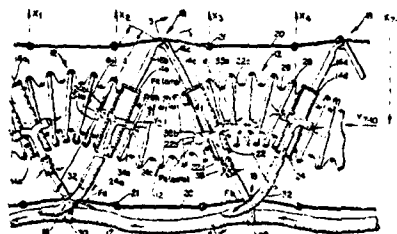
17 Claims

Method and apparatus wherein complex multiplanar surface motion of the sea or other fluid body is converted into usable energy. One embodiment of the apparatus comprises a pair of flexible tubular pumping elements that pump a fluid, such as sea water, to load such as a storage means or an energy converter such as a turbine driven prime mover. The apparatus makes use of multiplanar waves and surface currents that axially flex the pumping elements to provide hydraulic or pneumatic pressure for pumping the water. Floats distributed along the pumping elements support the apparatus horizontally at the surface of the sea and act as a breakwater. Lever arm struts, attached to the floats, are coupled together with swivel connector linkage to form a flexible beam or truss structure that permits the pumping elements to flex axially as complex wave systems and currents apply natural multiplanar forces to the floats. Protective chord segments, connected between adjacent strut ends, act as an expansion curb to prevent the pumping elements from flexing or expanding excessively due to strong surface currents and waves. Output tube segments connected to outlet valves on the pumping elements direct pumped fluid to a collector tube for transfer to the load. The output tube segments may be formed of flexible tubing or the lever arm struts may be tubular

Keywords: Power, wave; Pump

U.S. Cl. X.R. 60-499; 60-501; 92-39; 92-42; 92-44; 290-42; 290-53

and adapted for delivering the pumped fluid to the collector tube. To maximize sensitivity of the apparatus and minimize vulnerability to damage the fluid carrying collector tube is maintained below the surface of the water and the apparatus is provided with an anti-fouling coating to prevent such resistance as barnacle build-up.



3,962,083

**APPARATUS AND METHOD FOR PROTECTING A  
SHORELINE AGAINST CONTAMINATION FROM AN OIL  
SPILL**

Max Goldman, Latham, N.Y., assignor to RRC International,  
Inc., Latham, N.Y.

Continuation of Ser. No. 417,478, Nov. 19, 1973, abandoned.

This application Feb. 27, 1975, Ser. No. 553,592

Int. Cl.<sup>2</sup> B01D 41/02; C02B 9/02; E02B 15/04

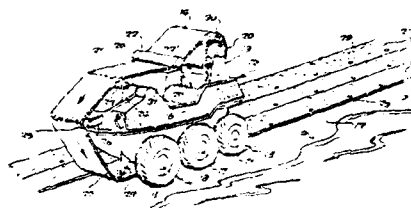
U.S. Cl. 210-79

24 Claims

Apparatus for treating a shoreline against contamination from an oil spill on adjacent waters comprising a first vehicle for laying down a web of oil absorbing material on said shoreline and taking up said web after it has absorbed oil, a second vehicle for transporting said first vehicle and said webs to the area of said shoreline, and a third vehicle for storing oil extracted from said web by extraction mechanism on said first vehicle. An all-terrain vehicle for laying a web of oil absorbing material on a shoreline including a vehicle body supported by a plurality of wheels, means on said body for supporting a coiled web of said oil absorbing material and for guiding said web onto said shoreline, and means for coiling said web back onto the vehicle and extracting oil therefrom. A method of treating a shoreline against contamination from an oil spill comprising the steps of transporting a web laying vehicle and a plurality of oil absorbing webs to said shoreline, causing said web laying vehicle to lay said oil absorbing webs onto said shoreline, taking up said oil absorbing webs and extracting oil from them, and conveying said extracted oil away from said shoreline. A web for use in absorbing oil deposited on a shoreline including spaced layers of plastic netting confining shredded polyolefin fibers therebetween.

Keywords: Fabric mat; Pollutant absorption;  
Pollutant, mechanical removal;  
Wave absorber beach

U.S. Cl. X.R. 210-242AS; 210-DIG.26



JUNE 15, 1976

3,962,803

**DREDGING HEAD**

Charles F. O'Brien, Golden Valley, Minn., assignor to National  
Car Rental System, Inc., Minneapolis, Minn.

Filed Oct. 18, 1974, Ser. No. 515,992

Int. Cl.<sup>8</sup> E02F 3/92, 3/94, 3/06; B65G 33/00

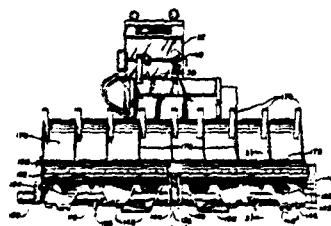
U.S. Cl. 37-66

8 Claims

A dredging apparatus having an improved dredging head in which the suction pump and drive motors for the same are mounted adjacent the clean-out and cutting augers for increased pumping efficiency. The augers include a cooperating plurality of cutting teeth mounted peripherally on the flighting of the auger and extending spirally along the same to provide for a continual shearing cutting surface in a line parallel to the rotational shaft of the augers for more efficient cutting of the fibrous materials.

Keywords: Dredge, cutterhead; Dredge intake;  
Pump; Water plant removal

U.S. Cl. X.R. 37-43E; 37-57; 37-189; 56-294;  
198-217; 299-87



3,962,875

# OIL FENCE HAVING A LIMITED FLEXIBILITY

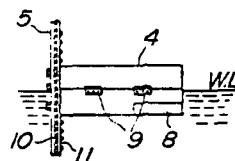
Kuninori Aramaki; Yasuharu Kawaguchi, both of Yokohama, and Hiroshi Kawakami, Kamakura, all of Japan, assignors to Bridgestone Tire Company Limited, Tokyo, Japan  
Continuation of Ser. No. 373,222, June 25, 1973, Pat. No. 3,867,817. This application Oct. 23, 1974, Ser. No. 517,576  
Claims priority, application Japan, June 29, 1972, 47-64431  
Int. Cl.<sup>2</sup> E02B 15/04

U.S. Cl. 61-1 F

2 Claims

An oil fence having a unidirectional flexibility, comprising a plurality of rigid floats which are swingably connected by hinge means. Planar skirts are connected to the floats so as to define at least one continuous oil fence wall thereby.

Keywords: Pollutant collection; Pollutant, surface barrier



3,962,877

# OFF-SHORE POWER PLANT

Peter Schlemichen, Hunxe, Germany, assignor to Deutsche Babcock & Wilcox Aktiengesellschaft, Oberhausen, Germany

Filed Mar. 6, 1975, Ser. No. 555,898

Claims priority, application Germany, Mar. 16, 1974, 2412662

Int. Cl.<sup>2</sup> F02C 7/08; E02B 17/00; B63B 35/02

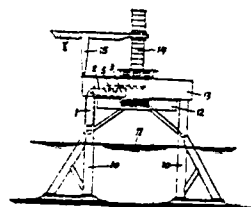
U.S. Cl. 61-46.5

9 Claims

An off-shore power plant in which the steam generators of the power plant are located within the support structure carrying the components of the power plant. The steam generator is operated with superpressure in the combustion chamber. A gas turbine is connected to the flue gas smoke stack of the combustion chamber, and a steam turbine is connected to the steam duct of the chamber. The support structure holding the steam generator carries a platform with several decks. The water treatment and gas purification equipment is located on the lower deck, whereas the upper deck carries the turbines and the generators.

Keywords: Electrical generator; Offshore platform, fixed

U.S. Cl. X.R. 60-39.18B; 114-.5R



3,962,878

# STABILIZATION OF MARITIME STRUCTURES

Frode Johan Hansen, Kingswood, England, assignor to Redpath Dorman Long (North Sea) Limited, Bedford, England  
Filed July 17, 1974, Ser. No. 489,392

Claims priority, application United Kingdom, July 20, 1973, 34680/73; Oct. 9, 1973, 47095/73

Int. Cl.<sup>2</sup> E02B 17/00

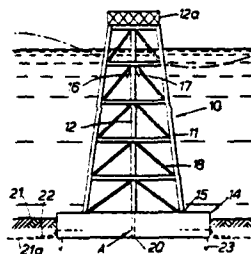
U.S. Cl. 61-46.5

11 Claims

A maritime assembly incorporating a foundation raft for founding, or when founded, on a sea bed, and having venting means responsive to the movement of waves whereby pore pressure at at least one point beneath the raft is reduced with respect to the hydrostatic pressure appropriate to the external depth of water below the mean level of water in which the raft is (to be) founded.

Keywords: Offshore platform, fixed; Seabed foundation; Seabed soil treatment

U.S. Cl. X.R. 61-46





3,962,880  
**COLUMNS FOR PLATFORMS, PIERS, CAUSEWAYS AND  
 THE LIKE, AND METHOD OF ERECTING SAME**  
 Rud J. Babor, N. Mountain Ave., Bound Brook, N.J. 08805  
 Filed Aug. 5, 1974, Ser. No. 494,705  
 Int. Cl.<sup>2</sup> E02D 7/24

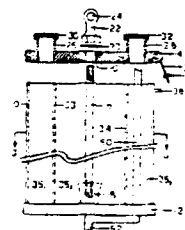
U.S. Cl. 61—53.74

6 Claims

Hollow casings containing a plurality of vertical compartments are towed or floated to an erection site where they are filled with concrete or removable pillar members to form respectively, permanent or temporary columns for supporting drill platforms, piers, etc. First chains or weights are placed in one compartment of a casing to erect it without flooding, and then concrete or removable pillar sections are placed in a second compartment while compressed air is supplied through a third compartment underneath the casing to blow the sand on the bottom of the body of water away to permit the casing to embed itself in the floor of the body of water. Additional concrete or chains, for permanent and temporary columns, respectively, may be added to the several compartments, including that which contained the compressed air line, usually after the removal of the line therefrom, to anchor the column firmly in place.

Keywords: Offshore caisson; Offshore construction; Offshore platform, leg; Pile driver, water jet

U.S. Cl. X.R. 61-52



3,962,982  
**FAIRINGS FOR CABLES FOR THE TOWING OF AN  
 IMMersed BODY**  
 Jean A. R. Marchay, Bourg-la-Reine, and Andre Y. C. Lelievre, Meudon, both of France, assignors to Etat Francais, France  
 Filed Jan. 28, 1975, Ser. No. 544,681  
 Claims priority, application France, Mar. 19, 1974, 74.09161

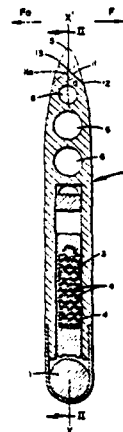
Int. Cl.<sup>3</sup> B63B 21/00

U.S. Cl. 114—235 F

13 Claims

A first fairing element, placed around a tow cable, is truncated along its trailing edge by a bevel which is inclined to the plane of symmetry of the element. Second fairing elements on each side of the first fairing element are also truncated by bevels which are symmetrical to the plane of symmetry of the second fairing element but oppositely inclined. The truncation of the trailing edge of the fairing elements may also be defined by a surface which is symmetrical with respect to the plane of symmetry of the element and has a concavity directed outwards. The truncation may furthermore be defined by a surface perpendicular to axis of symmetry of the fairing element.

Keywords: Towing cable



328

3,963,617  
**RETRIEVAL MEANS FOR A FLOATING LIQUID  
 SPILLING**

William P. Kirk, 22 Glenhaven Circle, Saco, Maine 04072, and  
 Dwight W. Reynolds, R.F.D. 1, Box 49, Pownal, Maine  
 04069

Filed Jan. 22, 1975, Ser. No. 543,169  
 Int. Cl.<sup>3</sup> E02B 15/04

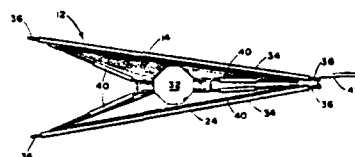
U.S. Cl. 210—242 S

12 Claims

A flexible sheet having weight means adapted for spreading the sheet over a liquid spilling and causing it to collapse into a floating position, thereby confining and concentrating a quantity of the spilling. The sheet has central flotation means and a vent for release of entrapped air.

Keywords: Pollutant collection; Pollutant, surface barrier

U.S. Cl. X.R. 61-1R; 210-DIG.25



3,964,184  
**METHOD OF REMOVING MATERIAL FROM A BED OF  
 A BODY OF WATER**

Thomas A. Mathieu, 2204 Justice, Office A, Monroe, La.  
 71201

Division of Ser. No. 373,140, June 25, 1973, Pat. No.  
 3,885,331. This application Apr. 21, 1975, Ser. No. 569,924  
 Int. Cl.<sup>3</sup> E02F 3/88; B63H 11/04

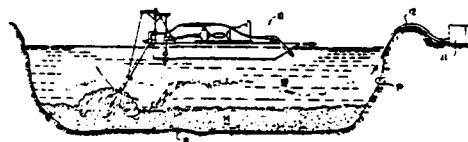
U.S. Cl. 37—195

10 Claims

A novel method of removing material from the bed of a pond, lake or like body of water utilizing a floating hull having a bow and stern by drawing water from the body of water at a point closely adjacent the hull, forming the drawn water into a plurality of generally parallel pressurized streams inclined to the horizontal directed rearwardly from the stern, releasing the pressurized streams in the body of water at points substantially removed and generally equidistant from the hull and adjacent the material thereby creating a material-water admixture and simultaneously propelling the hull in a forward bow leading direction, withdrawing the material-water admixture from the body of water, and additionally forming the drawn water into two additional pressurized streams which are selectively released in the body of water at points sidewise removed from the hull adjacent the bow and below the water surface for steering the hull during its forward stern-leading motion.

Keywords: Dredge, suction; Dredge propulsion; Seabed trencher

U.S. Cl. X.R. 37-63; 37-78; 114-151; 151-12R



JUNE 22, 1976

3,964,264

**WAVE-ACTION UNDERSEA-DRILLING RIG**

Michael G. Tornabene, c/o Amanda Machine Corp., 285 Oak Neck Lane, West Islip, N.Y. 11795

Continuation-in-part of Ser. No. 457,075, April 1, 1974. This application Oct. 11, 1974, Ser. No. 514,004

Int. Cl.<sup>2</sup> E02B 9/00; F16G 11/00

U.S. Cl. 61-20

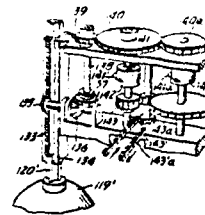
20 Claims

In a preferred embodiment, a clamping structure is mounted around a drilling-bit tube and is structured for permitting the clamping structure to rotate in counter-clockwise direction slidably around the drilling-bit tube and to permit the clamping structure to slide upwardly on the drilling-bit tube but to bring about a clamping and gripping of the drilling-bit tube whenever the clamping structure has clock-wise and/or downward force imparted thereto relative to a stationary state of the drilling-bit tube such that clock-wise and/or downward force on the clamping structure serves to rotate the drilling tube in a clockwise direction and/or to press and move downwardly the drilling-bit tube, and intimate with the clamping structure there being an outer-cylindrical-surface structure having helical female grooves extending angularly downwardly in each of clockwise and counter-clockwise directions, and there being a circumscribing cylindrical tubular structure having radially-inwardly extending finger-projections shaped for having their respective distal inner ends ride slidably mateably within the helical female grooves such that upward and downward alternate movements of the cylindrical tubular struc-

**Keywords:** Pile driver, impact; Power, wave; Sampler, power supply; Sampler, seabed-drilled core

U.S. Cl. X.R. 24-114.5; 24-115R; 60-398; 290-53; 294-1R; 417-333

ture imparts rotary motion to the outer-cylindrical-surface structure, and mounted intimately to and around the cylindrical tubular structure there being a spherically-shaped float having a large mass and defining in a substantially horizontal plane and extending around the periphery of the spherical shape thereof consecutive serially arranged uprightly-extending turbine-blade structures positioned and shaped such that water-current force on the turbine-blade structures imparts a clockwise motion to the float.



3,964,424

**INFLUENCE DETECTING GEAR WITH IMPROVED TOWING CHARACTERISTICS**

Julius Hagemann, Panama City, Fla., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Apr. 2, 1958, Ser. No. 726,019

Int. Cl.<sup>2</sup> B63B 21/56

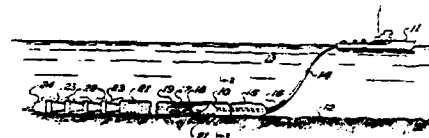
U.S. Cl. 114-235 B

4 Claims

1. A towable detecting gear adapted for dragging over a water-submerged surface comprising a tail portion, a towing cable having its trailing end enclosed in a tail portion and having at least one insulated conductor, a weight member secured to said cable at the forward end of the tail portion and having sufficient negative buoyancy to drag along said submerged surface when under tow, a plurality of detecting devices disposed at intervals along the cable in said tail portion and in electrical communication with a conductor therein, said detecting devices being substantially larger in cross section than the diameter of said cable, a layer of buoyant material surrounding said cable between said devices and having a thickness such that its diameter is at least equal to the diameter of said detecting devices, and an outer covering of wear resistant flexible material enclosing said tail portion.

**Keywords:** Instrument, seabed in situ; Instrument, towed; Seabed property measurement; Towing cable

U.S. Cl. X.R. 340-3T



3,965,364

**WAVE GENERATOR**

Manfred Wallace Gustafson, Gamla Fagerstavagen 4, and  
Kaj-Ragnar Loqvist, Regnbagsvagen 40, both of 773 00  
Fagersta, Sweden

Filed June 10, 1974, Ser. No. 478,145

Claims priority, application Sweden, June 18, 1973,  
7308523

Int. Cl.<sup>2</sup> F03B 13/10

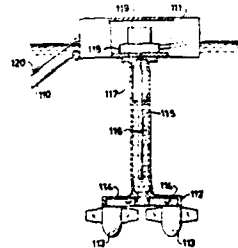
U.S. Cl. 290—53

7 Claims

A device for utilizing energy stored in wave motion. A buoyant body on the water surface is anchored so as to permit free, unrestricted vertical movement when acted upon by a heaving wave. An energy collecting member connected to the buoyant body and including propeller blades is located at a depth where the water is not subjected to the vertical wave motion.

Keywords: Electrical generator; Power, wave

U.S. Cl. X.R. 415-7; 417-331



3,965,365

**POWER GENERATING MACHINE ACTUATED BY  
OCEAN SWELLS**

Edward L. Parr, 301 N. Cuyamaca, El Cajon, Calif. 92020  
Filed Jan. 14, 1975, Ser. No. 540,889

Int. Cl.<sup>2</sup> F03B 13/12; B63H 1/39

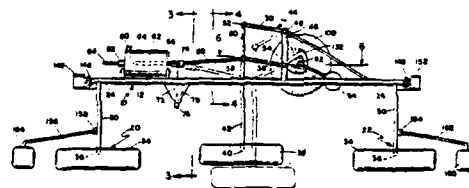
U.S. Cl. 290—53

15 Claims

A power generating machine which is actuated by the continuous swells occurring in the ocean. The machine is supported on a pair of spaced main floats, between which is a power float connected to a linkage which allows the power float to reciprocate vertically with the passing swells. A flywheel is driven through a one way clutch connected to the float linkage to drive an electrical generator, the linkage also being coupled to an air compressor. Sensing floats pivotally attached to the main float support structure detect the contour of the swells and, through associated drive means, cause the spacing of the main floats to be adjusted to the existing swells crest spacing for maximum efficiency.

Keywords: Electrical generator; Power, wave

U.S. Cl. X.R. 60-507; 290-42; 416-85; 417-61



JUNE 29, 1976

3,965,679

**WAVE ENERGY MACHINE**

Erasmus J. Paradiso, R.F.D. No. 1, West Edmeston, N.Y.  
13485

Filed June 14, 1974, Ser. No. 479,545

Int. Cl.<sup>2</sup> F16H 41/04

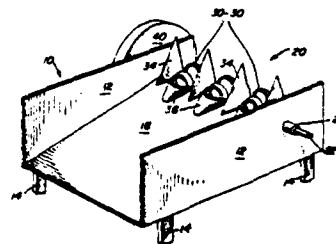
U.S. Cl. 60—398

5 Claims

A device for utilizing wave energy that is otherwise lost, or spent in eroding shore lines and/or shore facilities, having a combined trough-turbine arrangement is disclosed. Inclined ramp means, curved and triangular deflectors, bucket-wheel combinations, and turbine guards combine with a flywheel to provide smooth-flowing power from wave energy. The interrelationships of the various parts reduces turbulence and increases the thrust of an incoming volume of wave energy, to rotate a shaft from which power can be derived.

Keywords: Power, wave

U.S. Cl. X.R. 415-2



3,965,364

**WAVE GENERATOR**

Manfred Wallace Gustafson, Gamla Fagerstavagen 4, and  
Kaj-Ragnar Loqvist, Regnbagsvagen 40, both of 773 00  
Fagersta, Sweden

Filed June 10, 1974, Ser. No. 478,145

Claims priority, application Sweden, June 18, 1973,  
7308523

Int. Cl.<sup>2</sup> F03B 13/10

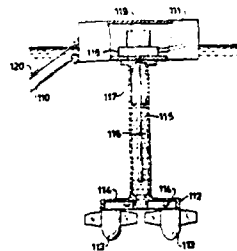
U.S. Cl. 290-53

7 Claims

A device for utilizing energy stored in wave motion. A buoyant body on the water surface is anchored so as to permit free, unrestricted vertical movement when acted upon by a heaving wave. An energy collecting member connected to the buoyant body and including propeller blades is located at a depth where the water is not subjected to the vertical wave motion.

Keywords: Electrical generator; Power, wave

U.S. Cl. X.R. 415-7; 417-331



3,965,365

**POWER GENERATING MACHINE ACTUATED BY  
OCEAN SWELLS**

Edward L. Parr, 301 N. Cuyamaca, El Cajon, Calif. 92020  
Filed Jan. 14, 1975, Ser. No. 540,889

Int. Cl.<sup>2</sup> F03B 13/12; B63H 1/33

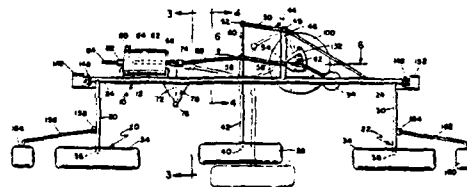
U.S. Cl. 290-53

15 Claims

A power generating machine which is actuated by the continuous swells occurring in the ocean. The machine is supported on a pair of spaced main floats, between which is a power float connected to a linkage which allows the power float to reciprocate vertically with the passing swells. A flywheel is driven through a one way clutch connected to the float linkage to drive an electrical generator, the linkage also being coupled to an air compressor. Sensing floats pivotally attached to the main float support structure detect the contour of the swells and, through associated drive means, cause the spacing of the main floats to be adjusted to the existing swells crest spacing for maximum efficiency.

Keywords: Electrical generator; Power, wave

U.S. Cl. X.R. 60-507; 290-42; 416-85; 417-61



JUNE 29, 1976

3,965,679

**WAVE ENERGY MACHINE**

Erasmus J. Paradiso, R.F.D. No. 1, West Edmeston, N.Y.  
13485

Filed June 14, 1974, Ser. No. 479,545

Int. Cl.<sup>2</sup> F16H 41/04

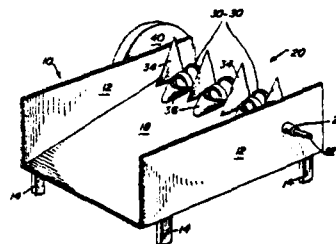
U.S. Cl. 60-398

5 Claims

A device for utilizing wave energy that is otherwise lost, or spent in eroding shore lines and/or shore facilities, having a combined trough-turbine arrangement is disclosed. Inclined ramp means, curved and triangular deflectors, bucket-wheel combinations, and turbine guards combine with a flywheel to provide smooth-flowing power from wave energy. The interrelationships of the various parts reduces turbulence and increases the thrust of an incoming volume of wave energy, to rotate a shaft from which power can be derived.

Keywords: Power, wave

U.S. Cl. X.R. 415-2



3,965,687

**APPARATUS FOR ANCHORING A STRUCTURE TO THE FLOOR OF A BODY OF WATER**

Clarence W. Shaw, Metairie, La., assignor to J. Ray McDermott & Co., Inc., New Orleans, La.

Filed Aug. 15, 1974, Ser. No. 497,629

Int. Cl.<sup>2</sup> E02D 7/24, 27/52

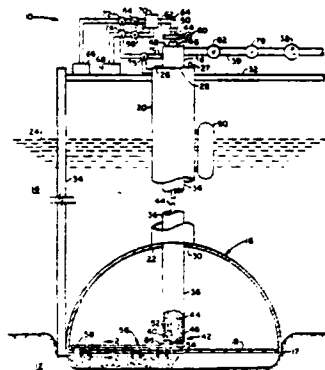
U.S. Cl. 61-46

8 Claims

An apparatus for anchoring a structure, such as a drilling platform, to a floor of a body of water has a movable jet nozzle operably disposed in a chamber which is lowered to the floor of a body of water. The jet nozzle is operable to slurry a portion of the floor underlying the chamber, and a pump is provided to evacuate the slurried portion of the floor to provide an excavation into which the apparatus may be lowered. Another pump may depressurize the chamber to provide a pressure differential to hydrostatically urge the apparatus towards the floor of the body of water.

Keywords: Offshore caisson; Offshore platform anchor; Pile driver, water jet

U.S. Cl. X.R. 37-57; 61-53.74; 61-82



3,965,688

**UNDERWATER STRUCTURES, IN PARTICULAR FOR UNDERWATER DRILLING OPERATIONS**

Peter Jensen, Boulogne, France, assignor to C. G. Doris, Paris, France

Filed July 24, 1974, Ser. No. 491,570

Claims priority, application France, July 25, 1973, 73.27245

Int. Cl.<sup>2</sup> E02D 27/00

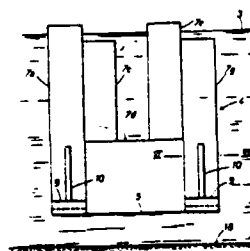
U.S. Cl. 61-50

9 Claims

A structure designed to rest upon the bed of a body of water, in particular to support fixed installations such as an off-shore drilling platform, comprising a central cavity without a base and surrounded by a double vertical wall spaced apart by vertical partitions, preferably of cylindrical shape, forming a plurality of compartments provided with bases at their bottom ends and extending above the double wall.

Keywords: Offshore platform, fixed; Seabed foundation

U.S. Cl. X.R. 61-52



3,966,597

# OIL OR ORGANIC SOLVENT-ABSORBENT

Akira Omori; Isao Okamura; Tadasi Imoto, all of Sagami-hara, and Takayuki Katoh, Tokyo, all of Japan, assignors to Teijin Limited, Osaka, Japan

Continuation-in-part of Ser. No. 360,534, May 15, 1973, abandoned, which is a continuation-in-part of Ser. No. 136,511, April 22, 1971, abandoned. This application Dec. 5, 1974, Ser. No. 529,907

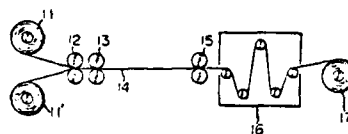
Claims priority, application Japan, July 28, 1970, 45-65893  
Int. Cl.<sup>2</sup> B01D 15/02; B29D 27/00; B32B 31/14

U.S. Cl. 210-39 27 Claims

An oil or organic solvent-absorbent is prepared by extruding a molten thermoplastic resinous polymer blend of polystyrene and polyethylene containing a foaming agent through a die having a slit aperture of 0.1 - 1.0 mm width, quenching the extrudate at the die exit to a temperature below the glass transition point of the resinous blend, drafting the extrudate at a draft ratio from the maximum draft ratio possible under the operating conditions to one-third the maximum draft ratio, laminating at least two sheets of the resulting unopened, sheet-like reticulated structure having numerous non-continuous cracks along one direction so that the direction of the cracks of each such sheet is the same, pulling the laminate in a direction perpendicular to the direction of the cracks to separate the constituent fibers from each other, and crimping the opened, sheet-like laminate either alone or together with at least one other sheet-like material; a process for removing oil or organic solvents with the absorbent product.

Keywords: Pollutant absorption

U.S. Cl. X.R. 156-85; 156-229; 156-244; 210-DIG.21; 260-2.5E; 264-51; 264-210R; 264-230; 264-237; 264-282; 264-DIG.8; 264-DIG.47; 428-253; 428-315



3,966,613

# APPARATUS FOR SPILLING RETRIEVAL

William P. Kirk, 22 Glenhaven Circle, Saco, Maine 04072, and Dwight W. Reynolds, R.F.D. 1, Box 49, Pownal, Maine 04069

Filed Jan. 22, 1975, Ser. No. 543,170

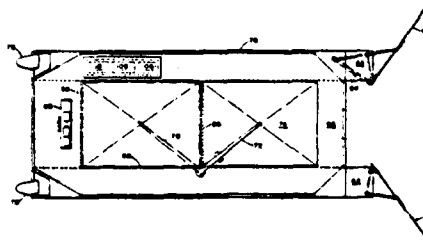
Int. Cl.<sup>2</sup> E02B 15/04

U.S. Cl. 210-242 7 Claims

A catamaran with pivotal fore and aft gates defining a well. When moved through a floating liquid spilling with the fore gate open the well collects spilling. The collected spilling may be pumped directly into a tank. Also, the catamaran is equipped with means to deploy a collapsible, floatable retrieval sheet over and into the well to confine the collected spilling, the aft gate being then opened to set the sheet adrift. A peripheral barrier of air bubbles concentrates the oil toward the center of the well.

Keywords: Pollutant collection; Pollutant removal watercraft

U.S. Cl. X.R. 210-DIG.25



322

3,966,614

**OIL SPILL CLEANUP SYSTEM**

Ray R. Ayers, Houston, Tex., assignor to Shell Oil Company, Houston, Tex.

Continuation of Ser. No. 292,028, Sept. 25, 1972, abandoned, which is a continuation-in-part of Ser. No. 225,987, Feb. 14, 1972, abandoned. This application July 29, 1974, Ser. No. 492,556

Int. Cl.<sup>1</sup> E02B 15/04

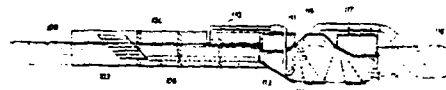
U.S. Cl. 210-242 R

14 Claims

Skimmer for removing oil from the surface of a body of water which is articulated from front to rear to be wave conformable and/or has a quiescent collection zone formed by bottom and/or forward baffles. Flexible skimming head for use with or independently of the above skimmer composed of a foraminous sheet having an integral chevron flow pattern on its upper surface; floating skimming head for use similar to the preceding head with a central, axially vertically movable cone or other configuration forming a suction mouth. Boom for use with or independently of the above skimmer which is composed of converging double booms. Storage capacity for oil collected by the above skimmer or otherwise composed of onboard and/or offboard membranes.

Keywords: Pollutant collection; Pollutant removal watercraft; Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.25



3,966,615

**OIL COLLECTION BARGE**

Sigvald L. Petchul, and Richard K. Petchul, both of 1380 SW. 57th Ave., Plantation, Fla. 33314

Filed June 25, 1974, Ser. No. 483,018

Int. Cl.<sup>1</sup> E02B 15/04

U.S. Cl. 210-242 R

8 Claims

A device which collects and then contains and concentrates oil spills on the surface of water. This action is affected by the flow of water and oil relative to a channel with an adjustable water and oil intake funnel at the forward end, an oil blockage wall at the rear, an adjustable flow splitter at the rear, a water vent at the rear bottom, and an adjustable vent plate at the rear bottom. These devices enable the operation of said action over large areas in a minimum of time and do so even given an adverse sea state.

Keywords: Pollutant removal watercraft; Pollutant, suction removal

U.S. Cl. X.R. 210-DIG.25





JULY 6, 1976

3,967,393

# UNDERWATER SOLIDS COLLECTING APPARATUS

Ralph Alan Nixon, Hamilton, Scotland, assignor to The Secretary of State for Trade and Industry in Her Britannic Majesty's Government of the United Kingdom of Great Britain and Northern Ireland, London, England

Filed Mar. 21, 1974, Ser. No. 453,638

Claims priority, application United Kingdom, July 4, 1973, 31935/73

Int. Cl.<sup>2</sup> E02F 3/88

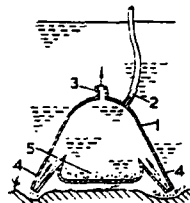
U.S. Cl. 37—58

3 Claims

The invention concerns an apparatus for collecting solids from the bed of a liquid or for establishing an anchorage in the bed of a liquid. The apparatus comprises essentially a substantially hollow structure into which solids from the liquid bed are induced as solids in liquid suspension. In the case of the apparatus being used for the collection of solids the structure is raised to the surface of the liquid for the solids to be harvested. When the apparatus is being used as an anchoring device the design is modified such that as solids from the liquid bed are induced into the substantially hollow structure they fill or partially fill the structure when then proceeds to bury itself into the liquid bed thereby establishing an anchorage.

Keywords: Dredge, suction; Offshore platform anchor

U.S. Cl. X.R. 37-61; 37-DIG.8; 210-170



3,967,449

# OCEAN THERMAL GRADIENT POWER PLANT

Earl J. Beck, 3045 Grove St., Ventura, Calif. 93003

Filed May 29, 1975, Ser. No. 582,017

Int. Cl.<sup>2</sup> F03G 7/04

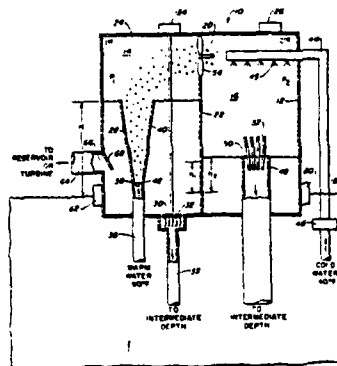
U.S. Cl. 60—641

50 Claims

An ocean thermal gradient power plant utilizing the concept of converting the potential and/or kinetic energy developed as a low pressure, high specific volume steam to a hydraulic or kinetic working head in seawater. The plant comprises a hull having a pair of air-evacuated, partially submerged compartments therein. Each compartment contains a static hydraulic head and is interconnected with the other compartment above the level of the static hydraulic heads. One compartment contains a steam-lift pump which, in addition to the static head therein, creates a hydraulic working head therein. The water from the hydraulic working head drives a turbine and then exits the compartment to an intermediate depth. Steam from the steam-lift pump is drawn into the other compartment where it is condensed by a barometric condenser. The water in this compartment exits via a pipe extending from the level of the static hydraulic head to an intermediate depth. A Taylor compressor is located at the orifice of the pipe to remove any collected air from the system.

Keywords: Power, submerged source

U.S. Cl. X.R. 60-398



3,967,456

**SEALING DEVICES**

William Bundy Stone, Norwich, England, assignor to Deep Sea Grouting Packers, Inc., Houston, Tex.

Filed Nov. 14, 1974, Ser. No. 523,803

Claims priority, application United Kingdom, Nov. 19, 1973, 53645/73; Mar. 5, 1974, 9886/74

Int. Cl.<sup>2</sup> E02D 5/34, F16J 15/40

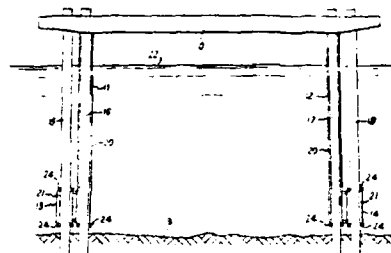
U.S. Cl. 61-46

22 Claims

A sealing device for sealing the gap between a tubular leg or a tubular piling can and a pile passing there-through and supporting a permanent platform at sea, the sealing device comprising a first part in the form of an annular sealing element and a second part, through which the pile can pass, in the form of an annular protective guard for the sealing element, both parts being coaxial with the leg or can, the guard, before a seal is made with the pile, lying between the sealing element and the pile, there being means provided which, in use, enable such relative movement in an axial direction between the guard and the sealing element, that the guard no longer protects the sealing element which is thus free to make sealing contact between the pile and the leg or can.

Keywords: Grouting; Pile, structure connection

U.S. Cl. X.R. 277-34; 285-18



3,967,457

**SELF-ELEVATING OFFSHORE DRILLING UNIT LEGS**

Peter M. Lovie, Houston, Tex., assignor to Engineering Technology Analysts, Inc., Houston, Tex.

Filed July 11, 1974, Ser. No. 487,574

Int. Cl.<sup>2</sup> E02B 17/00; F16H 19/04

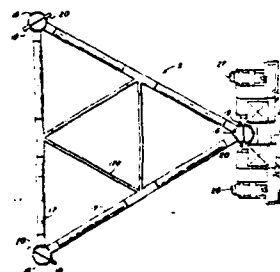
U.S. Cl. 61-46.5

17 Claims

Leg apparatus for an offshore drilling unit of the self-elevating type having a floatable hull and a plurality of legs movable from a raised position, in which the legs are supported by the hull in a body of water, to a lowered position, in which the hull is supported by the legs on the floor of the body of water. The legs may comprise a plurality of mutually parallel tubular chord members rigidly interconnected by structural bracing members. The tubular chord members may comprise an elongated tubular body and an elongated plate member, whose longitudinal axis coincides with the axis of the tubular body, rigidly connected to and spanning the interior of the tubular body.

Keywords: Offshore platform, jack up; Offshore platform, leg

U.S. Cl. X.R. 52-731; 61-53; 74-29; 254-106



3,967,458

**MARINE APPARATUS HAVING TELESCOPIC LEGS**

Ralph E. Scales, Beaumont, Tex., assignor to Bethlehem Steel Corporation, Bethlehem, Pa.

Filed Nov. 14, 1974, Ser. No. 523,934

Int. Cl.<sup>2</sup> E02B 17/00

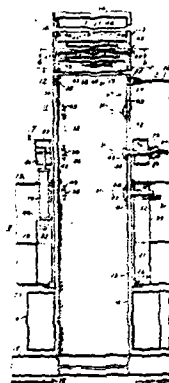
U.S. Cl. 61-46.5

26 Claims

A mobile marine apparatus has a platform, telescopic legs for supporting the platform, each telescopic leg having at least one inner section slidably mounted within an outer section, a frame member attached to the lower ends of the outer sections, a mat attached to the lower ends of the inner sections, locking means to selectively restrain relative movement between the sections and a jacking mechanism on the platform for selectively effecting or restraining relative movement between the platform and the sections and between the sections.

Keywords: Offshore platform, jack up

U.S. Cl. K.R. 254-105



3,967,569

**FLOATING DOCK**

Myron L. Shorter, Jr., 81 Calypso Shores, Ignacio, Calif. 94947

Filed Dec. 30, 1974, Ser. No. 537,602

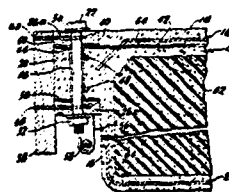
Int. Cl.<sup>2</sup> B63B 35/38

U.S. Cl. 114-.5 F

12 Claims

A floating wharf structure has a plurality of adjacent arranged interconnected float units, each float unit comprising an enclosed substantially rectangular shell structure. A device for interconnecting the float units comprises flange structures projecting from the sides of the float units having horizontal top and bottom mounting surfaces which cooperate with upper and lower stringers mounted respectively against the top and bottom mounting surfaces of the flange structures. These stringers extend longitudinally along a portion of the flange structures of at least two adjacent float units. Fastening devices vertically extend through said flange structures and the upper and lower stringers for securing upper stringers, flange structures and lower stringers together in compression.

Keywords: Pier, floating; Small-craft pier



3,967,570

# FLOATING DOCK BOAT LIFT

C. C. Bradfield, 175 E. Elmview, San Antonio, Tex. 78209  
Continuation-in-part of Ser. No. 455,128, March 27, 1975,  
abandoned. This application July 7, 1975, Ser. No. 593,329  
Int. Cl.<sup>2</sup> B63C 1/06

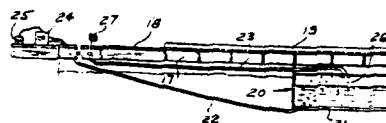
U.S. Cl. 114-45

6 Claims

A floating dock boat lift comprises a flat deck and a parent structure to which the deck is hinged. The free end of the deck over-lies a variable buoyancy chamber communicating by pipes or hoses to an inlet air pump on or near the parent structure and to an air release valve on or near the deck. Alternately, air venting, for buoyancy control in under-deck compartments, may be facilitated through valves at each compartment. The deck is provided with a combination metal and wood boat-supporting keel brace and underlying reinforcement members.

Keywords: Small-craft launcher; Small-craft service structure

U.S. Cl. X.R. 61-65



3,967,675

# METHOD AND DEVICE FOR EXPLOITING THE GEOTHERMAL ENERGY IN A SUBMARINE VOLCANO

Hans Christer Georgii, Stockholm, Sweden, assignor to AB  
Hydro Betong, Stockholm, Sweden

Filed Apr. 7, 1975, Ser. No. 565,611

Claims priority, application Sweden, Apr. 8, 1974, 7404701  
Int. Cl.<sup>2</sup> E21B 43/24

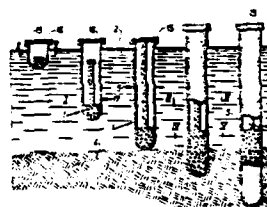
U.S. Cl. 165-1

11 Claims

For the exploitation of the geothermal energy in an active submarine volcano an elongated, substantially vertical, columnar concrete body is arranged above the orifice of the volcano so as to extend from the water surface vertically downwards through the water and into the magma in the orifice of the volcano so that the lower portion of the concrete body is submerged in the magma. The concrete body has such a displacement and such a weight that it floats in a balanced vertical position in the water and the magma. A coolant, preferably water, is circulated through internal cooling ducts or pipes in the concrete body from the upper end of the body downwards into the lower portion of the concrete body, which is submerged in the magma and where the coolant is heated by heat transfer from the surrounding magma, whereafter the heated coolant is returned through internal cooling ducts or pipes in the concrete body to the upper end thereof, where the heat content in the heated coolant is utilized.

Keywords: Offshore construction; Offshore platform, fixed; Power, submerged source

U.S. Cl. X.R. 165-45; 166-302



231

3,967,688

**FUEL INJECTION DEVICE FOR AN IMPACT  
ATOMIZATION-TYPE DIESEL PILE HAMMER**

Noriyasu Inenaga, and Mataji Tateishi, both of Nagasaki,  
Japan, assignors to Mitsubishi Jukogyo Kabushiki Kaisha,  
Tokyo, Japan

Division of Ser. No. 497,118, Aug. 12, 1974. This application  
June 2, 1975, Ser. No. 582,932

Claims priority, application Japan, Aug. 14, 1973, 48-90527  
Int. Cl.<sup>2</sup> E02D 7/12

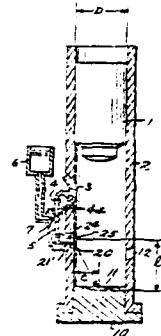
U.S. Cl. 173-137

4 Claims

The nozzle is provided with a bar which may be rotated to and fixed at various angular positions. The bar has a longitudinally extensive cut away portion, providing a fuel passage. Varying the angular position changes the turning velocity of the vortex-type jet issuing from the passage. The effect of varying the shape of the fuel passage is also described. The purpose of variation is to cause fuel to be properly retained on the saucer shaped top surface of the impact block until the piston strikes the surface, causing the fuel to atomize and be uniformly dispersed to enhance complete combustion of the fuel.

Keywords: Pile driver, impact

U.S. Cl. X.R. 123-46H; 123-46SC; 239-488



3,968,041

**APPARATUS FOR COLLECTING OIL SLICK FROM A  
BODY OF WATER**

Edwin A. De Voss, 1363 Clarence Drive, Vista, Calif. 92083  
Continuation-in-part of Ser. No. 128,766, March 29, 1971,  
abandoned. This application Sept. 12, 1973, Ser. No. 396,348  
Int. Cl.<sup>2</sup> E02B 15/04

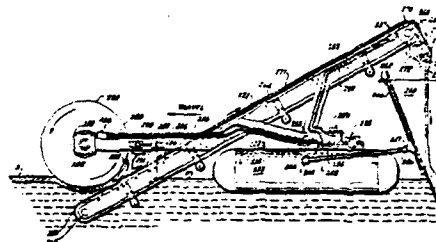
U.S. Cl. 210-242 S

19 Claims

A system for removing oil slicks from water surfaces such as the ocean, harbors, lakes or ponds. An endless conveyor, for example, the surface of a drum or of a belt, contacts the oil slick, which adheres to it. The slick is conveyed by the conveyor to means for its removal from the conveyor, for example, a wringer. Features of the invention which can variously be utilized are (a) the use of a flexible, relatively limber, flat blade-like cover for the conveyor, such as the well-known artificial grass "Astroturf"; (b) the use of a downwardly-facing region of the conveyor which can overhang and press against the top of the oil slick so the slick can adhere to the conveyor; and (c) the provision of a second conveyor aft of the first conveyor relative to the direction of forward motion of the system, the second conveyor extending below the elevation of the first conveyor, whereby they form an initially wedge-shaped path in which the slick tends to be trapped and drawn. The system can be mounted to floating support means for supporting it relative to the oil slick, and for moving it along the oil slick.

Keywords: Pollutant, mechanical removal;  
Pollutant removal watercraft

U.S. Cl. X.R. 210-DIG.25; 210-DIG.26



JULY 13, 1976

3,968,579

APPARATUS FOR SEDIMENT DREDGING AND OCEAN  
MINERAL GATHERING

André M. Rossfelder, 1805 Crespo Drive, La Jolla, Calif.  
92037

Filed Feb. 24, 1975, Ser. No. 552,363  
Int. Cl.<sup>2</sup> E21C 3/00

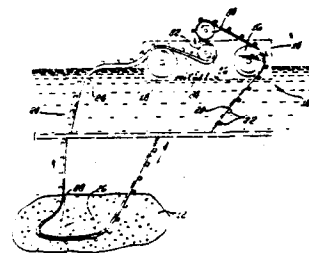
U.S. Cl. 37-69

15 Claims

An underwater mining or dredging apparatus having a supporting vessel and a continuous loop to which is attached a number of containers. In one embodiment, the loop is hollow and has a ballasted fluid in a lower portion while the descending portion is buoyant. This will reduce the likelihood of entanglement of the loop. In another embodiment, a weight sled is used to help gather the underwater aggregates and prevent wear of the loop. The loop may be designed to hydrodynamically resist entanglements and may be disposed laterally relative to the supporting vessel.

Keywords: Dredge, mechanical

U.S. Cl. X.R. 114-206R; 198-116; 299-9



3,968,855

SEISMIC MARINE GUN ASSEMBLY

John C. Mollere, Nassau Bay, Tex., assignor to Hercules Incorporated, Wilmington, Del.

Continuation-in-part of Ser. No. 115,361, Feb. 16, 1971, abandoned, and a continuation of Ser. No. 354,270, April 25, 1973, abandoned. This application Jan. 13, 1975, Ser. No. 548,363

Int. Cl.<sup>2</sup> G01V 1/38; F42D 3/06

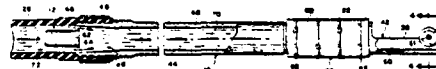
U.S. Cl. 181-118

6 Claims

The underwater gun assembly of this invention has an acceleration barrel and a firing gun. Percussion-initiatable cartridges are carried to the acceleration barrel by a stream of water. Each cartridge has an outside diameter which is nearly equal to the inside diameter of the bore in the barrel whose length is such as to allow the water pressure to optimally accelerate each cartridge in its trajectory through the barrel. The firing gun is detachably coupled to the barrel by a quick-disconnect coupling means. The detachable coupling means preferably includes a non-metallic resilient member which absorbs the shock waves from the ambient charge explosions, thereby preserving the integrity of the coupling means in respect of its detachable characteristics.

Keywords: Seismic explosive acoustic transmitter

U.S. Cl. X.R. 102-22; 181-114; 181-116;  
340-7R



JULY 20, 1976

3,969,834

AIRLIFT

Viktor Georgievich Geier, bulvar Pushkina, 33, kv. 3; Vladimir Ivanovich Gruba, bulvar Pushkina, 12, kv. 27; Nikolai Grigorievich Logvinov, Komsomolsky prospekt 25/111, kv. 34; Evgeny Vasilievich Uskov, ulitsa Artema, 58, kv. 35; Viktor Semenovitch Kostanda, ulitsa Gornovaya 18, kv. 1, and Vladimir Georgievich Mirgorodsky, prospekt Metallurgov, 25, kv. 1, all of Donetsk, U.S.S.R.

Continuation of Ser. No. 387,129, Aug. 9, 1973, abandoned.  
This application June 20, 1975, Ser. No. 588,954

Int. Cl.<sup>2</sup> E02F 3/88

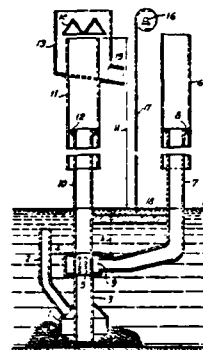
U.S. Cl. 37-58

1 Claim

An airlift for lifting liquids and pulps, comprising a suction unit for sucking in a mass being transported, an air duct for the supply of compressed air and a mixer for mixing compressed air with the mass being transported. The mixer is in communication, via a pipeline, with the suction unit and the air duct. Transfer of the mass being transported from the mixer to an air separator is effected with the aid of another pipeline provided in the airlift. The mixer is rigidly fixed to this pipeline and the air duct. The air duct and the pipeline for lifting the mass being transported have vertical portions, each consisting of at least two pipes fitted one into the other and capable of vertical movement relative to each other. The air duct and the pipeline are communicated with a lifting gear for transfer of the lower pipes of the air duct and the pipeline in the vertical direction together with the suction unit and the mixer.

Keywords: Dredge, suction; Pump

U.S. Cl. X.R. 302-58



3,969,900

BREAKWATER CONSTRUCTION

Tomasz Plodowski, Upper Montclair, N.J., assignor to Raymond International, Inc., Houston, Tex.

Filed Aug. 29, 1974, Ser. No. 501,829

Int. Cl.<sup>2</sup> E02B 3/06

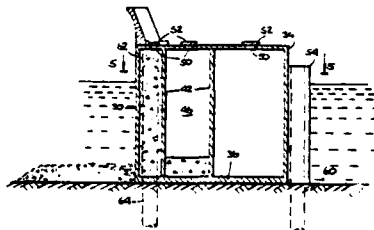
U.S. Cl. 61-4

15 Claims

A breakwater construction comprising hollow tank like modules of nearly neutral buoyancy and connected to the sea bed by means of pile like members. The buoyancy distribution of the modules is established such that they tend to tilt against the direction of wave action. This tendency to tilt in turn acts to prestress the pile like members.

Keywords: Breakwater, concrete; Offshore caisson; Offshore construction; Seabed foundation

U.S. Cl. X.R. 61-102



3,969,901

# FLOATING BREAKWATERS

Tadashi Matsudaira, Tokyo, and Yoshihiro Mishina, Matsudo, both of Japan, assignors to Ishikawajima-Harima Jukogyo Kabushiki Kaisha, Tokyo, Japan

Filed Aug. 23, 1974, Ser. No. 500,178

Claims priority, application Japan, Aug. 28, 1973, 48-95769; Sept. 26, 1973, 48-107534

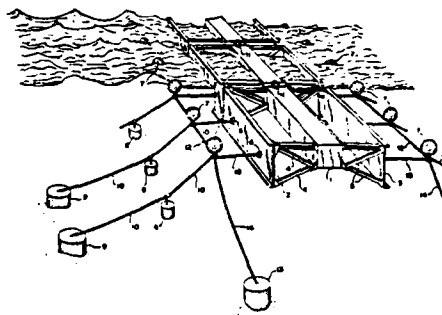
Int. Cl.<sup>1</sup> E02B 3/04

U.S. Cl. 61-5

8 Claims

A floating breakwater is disclosed which comprises a plurality of floating breakwater units interconnected with each other in side by side relation and anchored to the sea bottom with anchor cables or chains. Each floating breakwater unit comprises a center float, a front and rear barrier joined thereto with connecting members in suitably spaced apart relation or directly joined to the center float so as to define the separated spaces therebetween. The pitching, heaving and surging of the floating breakwater may be minimized, and the waves of a relatively wide range of wave lengths may be effectively reflected and depressed or abated so that a safe and comparatively calm sea space may be provided behind the floating breakwater.

Keywords: Breakwater, floating



3,969,925

# IN SITU OCEANOGRAPHIC SAMPLE SEPARATOR

Shale Jack Niskin, Miami, Fla., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Sept. 16, 1975, Ser. No. 613,843

Int. Cl.<sup>1</sup> G01N 15/00

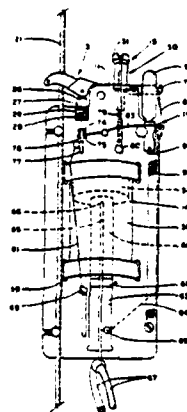
U.S. Cl. 73-61 R

17 Claims

A sampler for in situ oceanographic investigation is provided. At any desired depth, water is drawn into the sampler, treated with a desired liquid, and expelled from the sampler by gas pressure. Any particulate matter in the sample is retained on a filter of desired pore size.

Keywords: Sampler, suspended sediment

U.S. Cl. X.R. 73-170A; 73-425.4R





3,970,156

# WATER WEIGHTED CORER

Shale Jack Niskin, Miami, Fla., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Sept. 15, 1975, Ser. No. 613,703

Int. Cl.<sup>2</sup> E21B 7/12

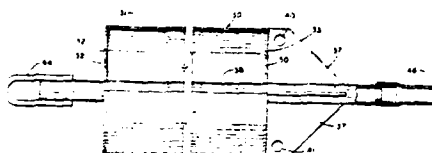
U.S. Cl. 175-6

7 Claims

A water-weighted corer comprising a cylindrical tank mounted concentrically on a core barrel intermediate the coring tube and the shackle is provided. The tank has a water inlet at its bottom and an air vent at its top so that during descent water enters the tank through the bottom inlet, forcing air out the top vent. During free fall the falling speed imparts a substantial amount of kinetic energy to the water mass in the tank, providing the driving force required for the corer to penetrate deeply into a sediment bed.

Keywords: Instrument deployment; Instrument retrieval; Sampler, seabed-driven core

U.S. Cl. X.R. 60-DIG.9; 114-206R; 173-DIG.1; 175-58



3,970,169

# GANGWAY LADDER

Bernabe Hernandez Gonzalez, Calle Villalba Hervas 12<sup>a</sup>, Santa Cruz de Tenerife (Canarias), Spain

Filed Nov. 7, 1975, Ser. No. 630,063

Claims priority, application Spain, Mar. 8, 1975, 210608

Int. Cl.<sup>2</sup> B65G 11/00; E06C 9/06

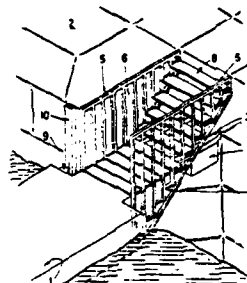
U.S. Cl. 182-1

4 Claims

A gangway-ladder, for connecting a floating mooring platform to the shore whilst accommodating changes of level of the platform due to tides, has a guide structure with channels received individual steps capable of forming a ladder, the floating platform having beams engaging under the steps so that, as the platform rises with the tide, the beam means engage under the steps and successively lift them until, at the highest position of the platform, the steps are all in a horizontal plane.

Keywords: Pier, floating; Small-craft pier

U.S. Cl. X.R. 14-71.1

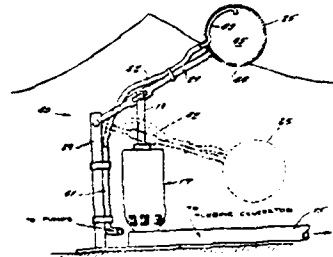


3,970,415  
**ONE WAY VALVE PRESSURE PUMP TURBINE  
 GENERATOR STATION**  
 Kaj Widemantz, P.O. Box 72, and William R. Gatton, P.O.  
 Box 222, both of Port Republic, N.J. 08241  
 Filed Apr. 10, 1975, Ser. No. 566,794  
 Int. Cl.<sup>3</sup> F04B 17/00, 35/00  
 U.S. Cl. 417-332 2 Claims

Keywords: Electrical generator; Power, wave;  
 Pump

U.S. Cl. X.R. 60-496; 290-42

A new type of power generating plant that utilizes the motion of ocean waves to drive turbine generators in a power station; the plant including a series of underwater units each of which includes a hollow sphere that floats upon the water so that it rises and falls as waves move by, the ball being mounted on an end of a pivoting arm to which there is connected a piston slidable in a cylinder so to pump ocean water through a duct to the turbines in the power station.



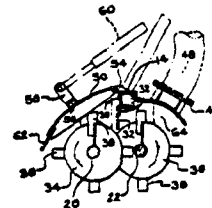
JULY 27, 1976

3,971,148  
**DREDGE CUTTER HEAD**  
 Troy M. Deal, 277 Trismen Terrace, Winter Park, Fla. 32789  
 Filed Feb. 10, 1975, Ser. No. 548,576  
 Int. Cl.<sup>3</sup> E02F 3/88  
 U.S. Cl. 37-66 5 Claims

Keywords: Dredge, cutterhead; Dredge intake;  
 Water plant removal

U.S. Cl. X.R. 56-9; 198-213

A dredge cutter head having mutually self-cleaning augers with a shrouded hood for nonstirring and non-clogging operation.



3,971,220

OIL FENCE

Takeo Kinase; Isamu Yano; Kanichi Okubo; Hidetoshi Kitakoga, and Hiromitsu Tayama, all of Sugemihara, Japan, assignors to Mitsubishi Denki Kabushiki Kaisha, Japan

Filed Feb. 15, 1974, Ser. No. 443,131

Claims priority, application Japan, Feb. 23, 1973, 48-23420[U]; Aug. 30, 1973, 48-101721[U]; Dec. 12, 1973, 48-144152[U]

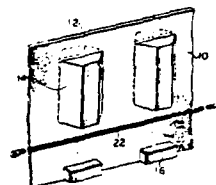
Int. Cl.<sup>2</sup> E02B 15/04

U.S. Cl. 61-1 F

3 Claims

An array of semicylindrical floats juxtaposed on one surface of a longitudinally elongated screen about each of spaced cross strips on the screen opposes a similar array disposed on the other surface of the screen and a chain-shaped sinker is disposed along one longitudinal edge of the screen. Also a floating framework is disclosed having one side partly cut away and roll means disposed in front of the cut-away portion. The roll means can be driven to sinusously house the oil fence within the framework and to pay it out from the latter. Alternatively, a takeup shaft disposed in a box-shaped member with buoyant chambers and fenders may be driven to coil and uncoil the oil fence on and from it through one open side of the box-shaped member.

Keywords: Pollutant removal watercraft; Pollutant, surface barrier



3,971,221

BREAKWATER SYSTEM FOR CREATING ARTIFICIAL SANDBARS

Charles W. Greenleaf, P.O. Box 156, Lakeside, Mich. 49116

Filed Oct. 4, 1974, Ser. No. 511,990

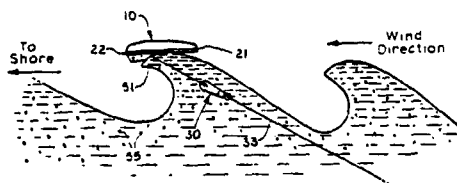
Int. Cl.<sup>2</sup> E02B 3/06

U.S. Cl. 61-5

7 Claims

Means for forming, at the bottom of a body of water, a barrier to substantially reduce the impact of waves developed in the body of water are disclosed. The means comprise a flotation member having a leeward end, means defining a pivotable axis for said flotation member, and structural means for applying a force to said flotation means. The force applied by the structural means causes the flotation member to pivot about the axis and urge the leeward end into the body of water. The leeward end, when urged into the body of water, causes particulate matter suspended therein to gravitate to the bottom to form a barrier for the waves. The force applied by the structural means are adapted to be overcome when waves of a predetermined substantial size are developed, whereupon the flotation member is temporarily pivoted about the axis to a substantially horizontal position relative to the surface of the body of water to prevent damage to the flotation member when waves of substantial size are developed.

Keywords: Bar protection; Breakwater, floating



**3,971,251**  
**DYNAMICALLY BALANCED APPARATUS FOR WATER**  
**BORNE INSTRUMENTS**

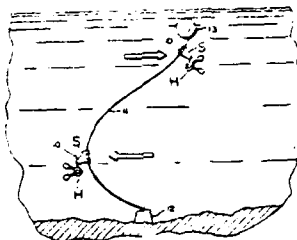
Shale J. Niskim, 2941 Lucaya St., Miami, Fla. 33133  
 Filed Apr. 16, 1975, Ser. No. 568,556  
 Int. Cl.<sup>2</sup> G01D 21/00

U.S. Cl. 73-170 A

9 Claims

A dynamically balanced apparatus for water borne instruments such as current direction and velocity meters having a stand off support rotatably secured to a cable whose lower end is anchored and its upper end attached to a buoy. A swivelled connector extends from the free end of the stand off to the mid-portion of an elongated cylindrical housing, the latter being rotatably mounted to the connector and weighted along its lower portion whereby the housing assumes a normal predetermined horizontal position at all times. A duct symmetrically disposed at each end of the housing and a water velocity and direction member mounted in each of the ducts. A pair of rudders extending rearwardly of the connector whereby the housing is constantly maintained in a direction facing the current and the ducts in a horizontal position for recording the direction and velocity of the current accurately.

Keywords: Buoy mooring system; Current measurement; Instrument deployment



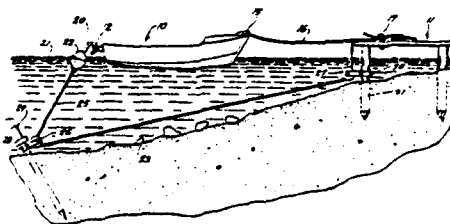
**3,971,329**  
**MOORING DEVICE**  
 Arthur J. Kosmatka, 7766 Honey Creek Parkway, Milwaukee, Wis. 53219  
 Filed July 19, 1974, Ser. No. 490,043  
 Int. Cl.<sup>2</sup> B63B 21/16

U.S. Cl. 114-230

2 Claims

A device for moving a boat from a dock with the boat being moored in the water a distance from the dock so that it will not be damaged by being tossed against the dock due to waves or choppy water. The boat is moved away from and to the dock by a mooring line which is attached to the front end of the boat. A second mooring line is provided having one end attached to the dock and extending under water about a pair of pulleys into securement with the rear end of the boat. With this arrangement of two separate mooring lines attached to separate ends of the boat, the latter can be safely anchored away from the dock and yet may be readily brought to the dock or moved away from it by a person standing on the dock.

Keywords: Small-craft mooring device



3,971,513

**DREDGE PUMP**

Johan Klip, Berkenwoude, Netherlands, assignor to Konijn Machinebouw B.V., Hoorn and Bagger-en Constructie Bedrijf Johan Klip B.V., Berkenwoude, both of, Netherlands  
Filed May 13, 1975, Ser. No. 577,008  
Claims priority, application Netherlands, May 22, 1974, 7406866

Int. Cl.<sup>2</sup> B02C 23/36

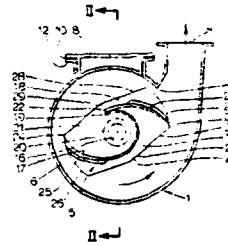
U.S. Cl. 241-46 R

9 Claims

Keywords: Dredge, suction; Pump

U.S. Cl. X.R. 241-185A

Dredge pump, comprising a volute pump casing, with a lateral, round suction opening and with an outlet. In this pump casing an impeller is mounted which consists of a front plate, a back plate and two blades connecting the front plate and the back plate to each other. One of these blades, which has at least substantially the form of a circular arc at its end nearest the axis of rotation and subsequently increases in radius, forms a passage which is connected through an opening in the front plate to the suction opening of the pump casing and which is passed in the direction of its lateral outlet by all dredged material which is to be pumped. The passage formed by the first blade increases gradually in width from the central inlet towards the lateral outlet, said central inlet being bounded by the part of the blade having at least substantially the form of a circular arc. The front plate and the back plate have a cutting edge along at least the greater part of their periphery, this cutting edge being located in their outer surface.



AUGUST 3, 1976

3,972,137

**DREDGING INSTALLATION**

Elle Condolios, Grenoble, France, assignor to Societe Generale de Constructions Electriques et Mecaniques (ALSTHOM), Paris, France  
Filed Apr. 1, 1975, Ser. No. 564,152  
Claims priority, application France, Apr. 24, 1974, 74.14298

Int. Cl.<sup>2</sup> G09B 25/00

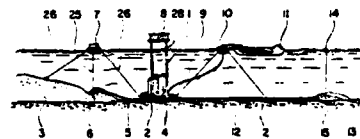
U.S. Cl. 37-56

5 Claims

Keywords: Dredge, suction; Offshore platform, fixed

U.S. Cl. X.R. 37-58

Dredging installation consisting of a fixed tower set on the sea bed and comprising silos for storing and decanting the dredged materials, with a mobile dredging pipe which can be moved on the sea bed from the silos to the dredging site and a lift pipe going from the silos to the loading ships.



3,972,198

**METHOD OF PROTECTING A PILE IMBEDDED IN OFFSHORE AREAS HAVING A SHIFTING LAYER OF MUD**

George P. Maly, Newport Beach, Calif., and Clifton A. Tannahill, Houston, Tex., assignors to Union Oil Company of California, Brea, Calif.

Continuation-in-part of Ser. No. 499,650, Aug. 22, 1974, Pat. No. 3,924,414. This application Sept. 12, 1975, Ser. No. 613,038

Int. Cl.<sup>2</sup> E02D 29/00

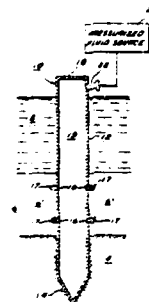
U.S. Cl. 61-98

14 Claims

A method for protecting a stationary rigid pile extending through a layer of mud susceptible to movement and imbedded in an underlying competent bottom from the forces which the mud can exert against the pile. Fluid is ejected outwardly from the interior of the pile through a plurality of orifices into the mud adjacent to the pile. The ejected fluid increases the fluid content of the adjacent mud and thereby reduces the forces which the mud can exert on the pile.

**Keywords:** Pile protection; Seabed foundation; Seabed soil treatment

U.S. Cl. X.R. 61-50; 61-53.74



3,972,199

**LOW ADHESIONAL ARCTIC OFFSHORE PLATFORM**  
Thomas A. Hudson, San Francisco, and Gordon E. Strickland, Jr., Yorba Linda, both of Calif., assignors to Chevron Research Company, San Francisco, Calif.

Continuation-in-part of Ser. No. 266,084, June 26, 1972, Pat. No. 3,831,385. This application July 29, 1974, Ser. No. 490,174

Int. Cl.<sup>2</sup> E02B 15/02; F24J 1/00

U.S. Cl. 61-103

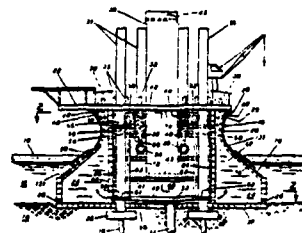
11 Claims

A method and apparatus for reducing ice forces on a marine structure erected in a body of water which becomes frozen through natural weather conditions. The structure has a low-ice-adhensional wall forming its perimetrical surface in the zone where natural ice will freeze onto or impinge against the structure. Enclosed chambers are built within the structure and may be in heat-transmitting relationship with the outer wall. Heat is applied to the chambers to heat and maintain the outer wall at a temperature above the melting point of the natural ice occurring in the water around it. In a preferred embodiment, the marine structure is formed with a heated wall which slopes upwardly and inwardly in the area of ice contact to provide a ramp-like surface upon which a sheet of ice will be forced with reduced friction as it moves against the structure. Thus, an edge of the sheet of ice will be prevented from strongly adhering to the structure either initially or subsequently. This sufficiently weakened ice-to-surface bond without heat or reduced heat to the outer wall allows the ice sheet to be lifted above its normal position on the water surface as the ice moves against the structure, causing the sheet to break any weak surface bond so it can be bent and fractured as it rides by the coated ramp-like surface and thereby

**Keywords:** Coating; Ice protection, Offshore platform, fixed; Offshore structure fender

U.S. Cl. X.R. 61-1F; 61-36A; 62-259; 114-40

reducing the force imposed by it on the structure. An alternate embodiment for reducing ice forces takes the form of a fully or partially coated cone or a cone made from material having low ice-adhesion properties. This embodiment may or may not be in combination with a heated surface.



3,972,231  
**METHOD FOR MEASURING VELOCITY AND  
 DIRECTION OF CURRENTS IN A BODY OF WATER**  
 William S. Richardson, Dania, Fla., assignor to The United  
 States of America as represented by the Secretary of the  
 Navy, Washington, D.C.

Filed Nov. 19, 1975, Ser. No. 633,538  
 Int. Cl.<sup>2</sup> G01W 1/00

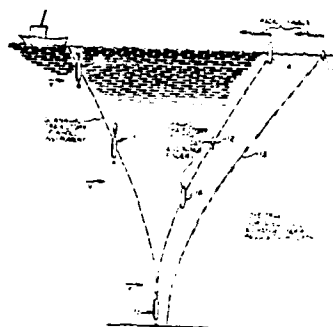
U.S. Cl. 73-170 A

6 Claims

A method for measuring the velocity and direction of currents in the ocean and other bodies of water. A first vehicle travels through water and leaves behind a trail of dye. A second vehicle travels, at a later time, the same path as that traveled by the first vehicle, and measures the distance and direction to the trail of dye. The vehicles may travel either from the surfaces downwardly or from the bottom upwardly.

Keywords: Current measurement; Instrument deployment

U.S. Cl. X.R. 73-189



3,973,236  
**HORIZONTAL HYDROPHONE ARRAY**  
 Robert B. McLaughlin, La Jolla, Calif., assignor to Lockheed  
 Missiles & Space Company, Inc., Sunnyvale, Calif.  
 Filed Dec. 23, 1974, Ser. No. 535,831  
 Int. Cl.<sup>2</sup> G01V 1/38

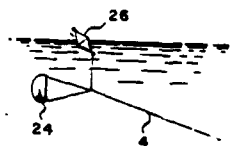
U.S. Cl. 340-7 PC

11 Claims

A system for maintaining a two-legged hydrophone array in a horizontal plane is disclosed. This system uses a pair of directional maneuverable drogue chutes for providing tension on the hydrophone arrays and for maintaining the desired angle between the two legs.

Keywords: Seismic hydrophone array; Towed body depth control

U.S. Cl. X.R. 114-209; 114-235B; 340-3T; 340-3PS



AUGUST 10, 1976

**3,973,405**

## SURGE GENERATORS OF THE PLUNGER TYPE

**Jacques Duport, St Ismier, France, assignor to Societe Generale de Constructions Electriques et Mecaniques (ALSTHOM), Paris, France**

Filed Oct. 30, 1975, Ser. No. 627,407

Claims priority, application France, Nov. 20, 1974,  
74.38166

Int. Cl.<sup>2</sup> E02B 3/00; A47K 3/10

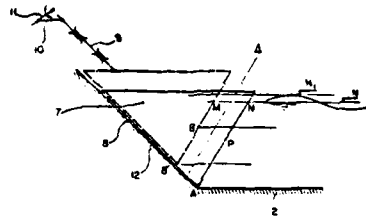
U.S. Cl. 61-1 R

## 1 Claim

Improvements to surge generators of the plunger type for generating surge in a test tank, consisting in imparting to the said plunger a movement through an angle in relation to the vertical position.

**Keywords:** Wave generator

U.S. Cl. X.R. 4-172.16



**3,973,406**

## CONTAINMENT BOOM

Gerald J. Casey, 1819 Curtis St., Berkeley, Calif. 94702  
Filed Dec. 26, 1974, Ser. No. 536,348

Filed Dec. 26, 1974, Ser. No. 536,348

Int. Cl.<sup>2</sup> E02B 3/00

**U.S. CL 61-1 F**

## 9 Claims

**A collapsible, quickly deployable floating boom barrier comprises an elongated curtain-like partition of strong, flexible, impervious material supported in a substantially vertical position in the water by a plurality of outrigger-type flotation units spaced along the partition.**

The partition is in the form of an elongated, flexible belt which has a smooth surface on the side opposite the flotation units, and the smooth side surface engages the material to be contained by the barrier.

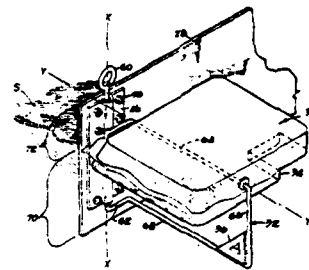
The barrier has sufficient longitudinal flexibility to encircle an oil spill or a ship that might be unloading or loading oil, and the outrigger flotation units support the partition or belt at a height above the surface of the water which is approximately  $\frac{1}{4}$  to  $\frac{1}{2}$  of the partition width.

Each outrigger flotation unit comprises a frame and a float. The frame is connected to the side of the partition or belt for pivoting action about a vertical axis extending parallel and immediately adjacent to the side of the belt, and the float is connected to the frame for pivoting action about a horizontally extending axis. This articulation of the frame and float

**Keywords:** Pollutant collection; Pollutant, surface barrier

U.S. Cl. X.R. 61-5

provides a self-stabilizing action of the outrigger flotation units. It also permits each float and frame to be folded back flat against the side of the belt to facilitate deployment of the floating barrier through narrow passageways such as between ships and piers. This articulation also permits the barrier to be folded accordion fashion for compact storage and transport.





3,973,864

**TIDE MOTOR**

Dewitt T. Atherton, 407 West E St., Encinitas, Calif. 92024

Filed Jan. 24, 1975, Ser. No. 543,685

Int. Cl.<sup>2</sup> F03B 7/00, 13/12

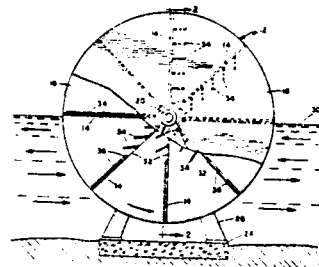
U.S. Cl. 415-8

1 Claim

A wave motor is comprised of two or more parallel rotors having apertured radial paddle elements with hinged flaps or blades covering the apertures such that upon the impingement of water upon one side of the paddles the blades cover the apertures and the wheel is turned, but upon impingement of water against the other side of the paddles the blades swing open. Each pair of rotors are coaxially mounted and designed for rotation in opposite directions to maximize extracted power regardless of the predominant current direction, and a single take off shaft is coupled to the rotors through a ratchet and gear mechanism.

Keywords: Power, tide

U.S. Cl. X.R. 415-61; 415-140; 416-128



AUGUST 17, 1976

3,974,652

**DEVICE FOR CONVERTING WAVE ENERGY IN BODIES OF WATER**

August Otto Lovmark, 8710 Cypress Ave., Cotati, Calif. 94928

Filed July 16, 1975, Ser. No. 596,442

Int. Cl.<sup>2</sup> F03G 7/00, 7/08

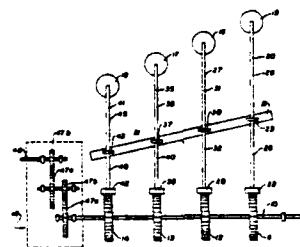
U.S. Cl. 60-398

5 Claims

There is disclosed a device to convert water wave motion into useful energy which includes a shaft mounted to be rotatable and having fixed thereto a plurality of gears, a plurality of floats equal in number to the plurality of gears with each float connected by an arm, through a fulcrum, to a ratchet-like device on the other end of the arm from the float, which ratchet-like device drives one of the gears. The shaft drives a gear train which results in a rapidly rotating shaft which drives a pump which takes suction from a low pressure reservoir and discharges to drive a fluid-driven motor. Between the discharge side of the pump and the fluid-driven motor are a high pressure reservoir for the driving fluid, a regulating valve, and a pressure relief valve which discharges into the low pressure reservoir, whereby the action of waves in a body of water causes a continuous surge of fluid through the motor at a uniform pressure.

Keywords: Power, wave

U.S. Cl. X.R. 60-413; 60-505; 60-506; 60-507; 417-332



3,974,654

**SELF-REGULATING TIDE GATE**

Matthew Mirto, Jr., Stratford, Conn., assignor to W. S. Rockwell Company, Fairfield, Conn.

Filed Oct. 28, 1975, Ser. No. 625,861

Int. Cl.<sup>2</sup> E02B 7/40

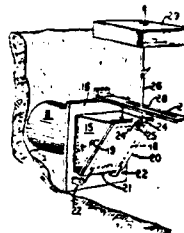
U.S. Cl. 61-17

12 Claims

A self-regulating device for controlling the flow of water from a conduit open end into a reservoir or wet marshland and to an outside body of water, such as tidal water, which includes a gate pivotally mounted at its bottom edge so as to be pivotable upwardly to close the conduit end. A rod is pivotally connected to the upper edge of the gate and extends upwardly through a slotted bracket, and a float is mounted on the upper portion of the rod above the bracket. As the level of the tidal water rises, the float will rise and move the gate into the closed position.

Keywords: Channel barrier; Tidal estuary water level

U.S. Cl. X.R. 61-25; 61-26; 61-27; 137-409; 137-448



3,974,657

**MODULAR OFFSHORE STRUCTURE SYSTEM**

Maurice N. Sumner, 1718 Lubbock St., Houston, Tex. 77007

Division of Ser. No. 243,790, April 13, 1972, Pat. No.

3,874,180, which is a division of Ser. No. 107,288, Jan. 18, 1971, Pat. No. 3,716,993, which is a continuation-in-part of

Ser. No. 649,889, June 29, 1967, Pat. No. 3,575,005. This application Jan. 8, 1975, Ser. No. 539,300

Int. Cl.<sup>2</sup> E02D 27/38

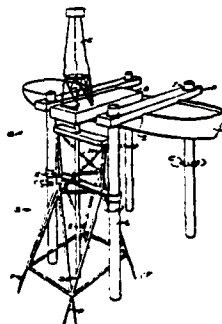
U.S. Cl. 61-50

3 Claims

A modular-like system of offshore structures for imparting flexibility to the offshore exploration and production and transportation industries so that exploration, production and development work can take place over a large range of marine depths and operational circumstances with one or more marine vessels.

Keywords: Offshore storage tank, submerged; Pile placement; Seabed foundation

U.S. Cl. X.R. 61-98; 114-5D



3,974,789

**FLOATING STRUCTURES INCLUDING HONEYCOMB  
CORES FORMED OF ELONGATE HEXAGONAL CELLS**

Sebastian J. de Groot, Trans Canada Highway, R.R. No. 1,  
Cobble Hill, British Columbia, Canada (VOR ILO)

Filed Aug. 5, 1974, Ser. No. 494,830

Int. Cl.<sup>3</sup> B63B 35/00, 5/14

U.S. Cl. 114—,5 F

29 Claims

A tug vessel and a plurality of transport modules connected together in a chain, each including a honeycomb core formed of an array of hexagonal cells (preferably formed of reinforced concrete), are disclosed. The modules and, if desired, the tug vessel are adapted to transport liquids, gasses, semi-solids (e.g. grain) and the like in the cells. Universal joint mechanisms connect the tug vessel and the modules together in a manner which allows the tug vessel and modules to move essentially independently with respect to one another. The tug vessel includes a pair of oppositely rotating propellers, located amidships at the rear of sponsons. In addition, gimble jet exhaust nozzels are used to control the attitude of the tug vessel. Emptying and filling of the hexagonal cells is accomplished via a conduit array which uses a central cell to act as communication chamber for surrounding cells. Cells located along the lateral sides of the overall array are used to house ballast water.

Keywords: Pier, floating

U.S. Cl. X.R. 9-8R; 114-65A; 114-74T;  
114-235R



AUGUST 24, 1976

3,975,784

**MARINE STRUCTURE**

Charles T. Whitaker, Batwyn, Australia, assignor to Marine  
Consultants Pty., Ltd., South Melbourne, Australia

Filed Aug. 7, 1974, Ser. No. 495,535

Claims priority, application Australia, Aug. 9, 1973,  
4419/73

Int. Cl.<sup>3</sup> B63B 21/52

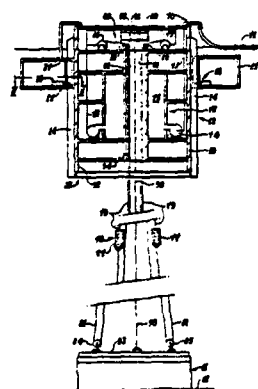
U.S. Cl. 9-8 R

14 Claims

A marine structure having a buoyant tower flexibly connected to a base on the sea bed. The buoyant tower includes a buoyant tank which is movable in guide tracks extending lengthwise of the tower. The base may have drive tracks for moving along the sea bed so that material gathering, pipe laying or harbour construction operations on the sea bed can be carried out. For pollutants disposal the tower may receive waste, mix it with sea water and diffuse it into the sea.

Keywords: Dredge, suction; Dredge propulsion;  
Offshore platform anchor; Offshore  
platform, floating; Pollutant dis-  
persion; Seabed pipeline placement;  
Seabed trencher

U.S. Cl. X.R. 37-54; 61-72.4; 114-0.5R;  
114-230; 115-1R; 137-236



3,975,842

**METHOD AND APPARATUS FOR DREDGING  
EMPLOYING A TRANSPORT FLUID FLOWING IN  
SUBSTANTIALLY CLOSED RECIRCULATING COURSE**  
Johannes Franciscus Reinardus Andreae, Gorinchem, Netherlands, assignor to Bos Kalis Westminster Group N.V., Slidrecht, Netherlands

Filed Oct. 15, 1974, Ser. No. 514,506

Claims priority, application Netherlands, Oct. 15, 1973, 7314168

Int. Cl.<sup>2</sup> E02F 3/88

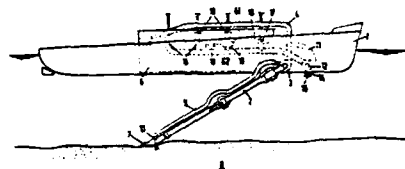
U.S. Cl. 37-58

4 Claims

Dredging or suction of a soil suspension from the sea bottom is effected through a suction conduit connected with a suction head enclosure resting on the sea bottom, there concurrently being supplied to the suction head enclosure and through a separate conduit connected therewith a transport fluid under pressure. Transport fluid is separated from the soil suspension collected at the surface and recycled to the suction head enclosure. Thus the transport fluid flows in a substantially closed recirculating flow course and consequently pollution of the sea is lessened.

Keywords: Dredge, suction

U.S. Cl. X.R. 37-63; 37-195; 299-9; 302-15



3,975,916

**LAMINATED PIER BUMPER**

Bert E. Watson, Santa Clara, Calif., assignor to Pawling Rubber Corporation, Pawling, N.Y.

Filed Mar. 14, 1975, Ser. No. 558,218

Int. Cl.<sup>2</sup> E02B 3/22; B63B 21/00

U.S. Cl. 61-48

4 Claims

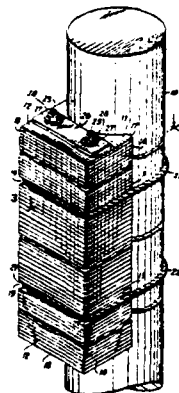
The disclosure relates to a pier bumper assembly intended particularly for marine application, for protecting dock pilings and dolphins from impact and chafing by contact with ships and barges. The bumper assembly is vertically oriented, and is secured over an exposed face of a marine piling. The pier bumper, which may have a substantial vertical height (e.g., 16 feet would not be unusual) is comprised of a vertically laminated stack of elastic plates, which are held under substantial compression by rods extending vertically through the stack. Along one side, the elastic plates are of deeply concave contour, to receive and partly embrace the generally cylindrical contours of the marine piling. A generally flat front face forms the impact surface.

At two or more locations along the overall vertical length of the bumper assembly, one or more of the plates are recessed and curved, to form a retaining groove. Cables received in the retaining grooves serve to secure the bumpers to the marine piling.

Typically, the dock bumpers of the invention may be utilized in conjunction with a plurality of side-by-side marine pilings, providing cooperative interaction between adjacent bumper assemblies.

Keywords: Pier fender; Pile protection

U.S. Cl. X.R. 114-219; 256-1



3,975,957

# SEDIMENT SAMPLING SYSTEM

Roderick S. Mesecar, Corvallis, Oreg., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Sept. 19, 1975, Ser. No. 615,017

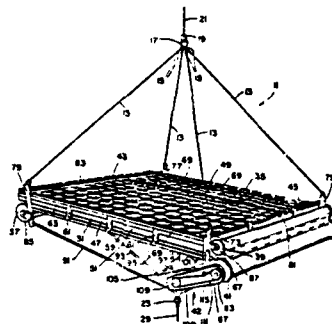
Int. Cl.<sup>2</sup> G01N 1/20

U.S. Cl. 73-170 A

9 Claims

A sediment sampling system that may be used for oceanographic sampling of detrital and sedimentary sized particles in multiple sequences for up to a period of several months. The sampling device has the basic feature of imposing a plastic sheet of sediment collecting material for a predetermined period of time and rolling it up interleaved with a cover plastic sheet, with the sample sandwiched therebetween, for storage. The system includes a sampling bed and an elongated roller at one end of the bed for supplying the sheet of sample collecting material. At the opposite end of the sampling bed are a top elongated cover sheet supply roller and a bottom elongated storage roller. Both the sample collecting material and the cover material, with the sample sandwiched therebetween, and rolled onto the bottom storage roller for storage after each predetermined sample collection period. A honeycomb structure is positioned above the bed to prevent ocean currents from disturbing the sample. An electronic timer and mechanical actuator system are employed to perform the above described functions and may provide variable timing sequences to accommodate different environmental conditions. The system also employs a subsurface float, an anchor, a flasher light and a radio beacon.

Keywords: Sampler, suspended sediment; Sedimentation measurement



3,976,021

# INSTALLATION OF VERTICALLY MOORED PLATFORM

Kenneth A. Blenkarn, and William D. Greenfield, both of Tulsa, Okla., assignors to Standard Oil Company (Indiana), Chicago, Ill.

Filed Sept. 8, 1975, Ser. No. 611,286

Int. Cl.<sup>2</sup> B63B 35/44

U.S. Cl. 61-89

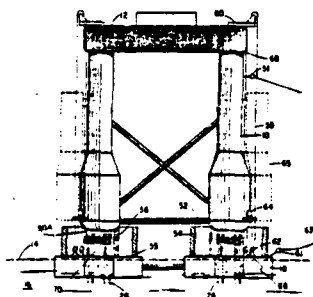
10 Claims

This invention relates to the installation of a Vertically Moored Platform and equipment and apparatus used in effecting such installation. The floating structure, anchored only by essentially parallel and vertical elongated members under tension, is positioned with a gravity base over the subsea well site. The gravity base is lowered from engagement with the floating structure with cables to the sea floor while maintaining the floating structure in a positive buoyancy state. A large-diameter drive pipe is inserted through each receiving passage in the gravity base and into the soil or rock beneath the gravity base where it is anchored. A conductor is inserted through the drive pipe and anchored or cemented to the soil or rock beneath the drive pipe. A riser pipe is then inserted into the drive pipe and secured to the conductor. The upper end of the riser pipe is secured to the floating structure. Up to 32 or more such risers are connected between the floating structure and the gravity base. The riser pipes are then placed under tension and the cables used to

Keywords: Offshore construction; Offshore platform anchor; Offshore platform, floating

U.S. Cl. X.R. 114-.5D

lower the gravity base are then removed. Drilling operations then proceed through each of the risers. Modification of this installation and equipment necessary therefor are described.



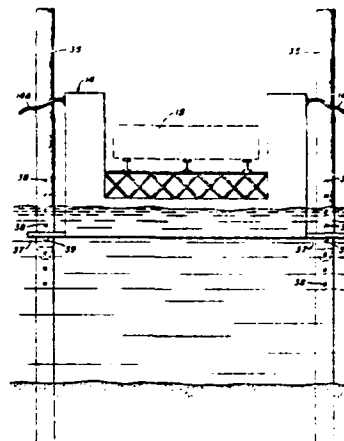
3,976,022  
**FLOATING DRY DOCK WITH BUOYANCY  
 CONTROLLED AIR INJECTION AND VENTING SYSTEM**  
 Pierre A. Lapeyre, P.O. Box 430, Houma, La. 70360  
 Filed Feb. 3, 1975, Ser. No. 546,790  
 Int. Cl.<sup>2</sup> B63C 1/02

U.S. Cl. 114-45

1 Claim

The present disclosure is directed to lifting boats and barges within a dry dock by means of compressed air. The air is conducted from compressor through hose lines to open bottomed compartments of the floating dry dock and controlled by remote actuated valves whereby either through adding air or venting air from the dock compartments the dock may be trimmed fore and aft as well as athwart ship to assure registry with a yard marine railway system. Support legs guide the up and down movement of the dock to assure alignment with the marine railway so that the vessel within the dock may be transferred by a dolly and rail system to the yard rail system. The floating dry dock upon achieving proper elevation releases a certain amount of air such that some negative buoyancy is attained and the dry dock and its within vessel are supported on the support legs which will prevent movement of the dry dock while transferring the vessel to shore and which will also prevent movement of the dry dock by wave action from passing vessels.

Keywords: Small-craft launcher; Small-craft service structure



3,976,570  
**METHOD AND APPARATUS FOR REMOVING  
 CONTAMINANTS FROM THE SURFACE OF A BODY OF  
 WATER**

Arthur W. McCray, 1110 Grove Lane, Norman, Okla. 73069  
 Continuation of Ser. No. 404,111, Oct. 5, 1973, abandoned.  
 This application Apr. 18, 1975, Ser. No. 569,261  
 Int. Cl.<sup>2</sup> C02B 1/14

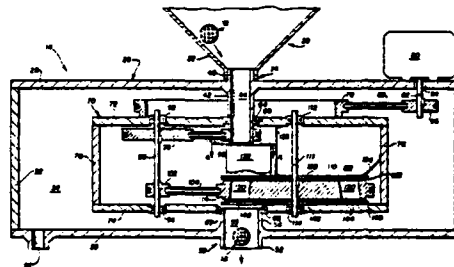
U.S. Cl. 210-30 A

16 Claims

A method and apparatus for removing oil or other hydrocarbons from the surface of a body of water by the distribution of discrete buoyant porous member upon the water surface, continuously removing the members from the surface, removing the absorbed oil from the members in a recovery assembly, and returning the members to the surface of the water for reuse. The members are rigid, porous spheres with oleophilic hydrophobic material herein. The recovery assembly includes a housing having a rotating frame therein with a wheel rotatably mounted thereon for carrying a plurality of members. A motor rotates the wheel and frame and a feed successively feeds members into the rotating wheel for centrifuging. A discharge removes the balls from the wheel after a set period of time and returns the balls to the surface of the water.

Keywords: Pollutant absorption; Pollutant collection; Pollutant, mechanical removal

U.S. Cl. X.R. 210-40; 210-242AS; 210-DIG.26; 233-25



AUGUST 31, 1976

3,977,030  
**ARRANGEMENT FOR HAULING UP, LAUNCHING AND  
 STORING OF BOATS AND THE LIKE**  
 Lars Ringdal, Montebelloveien 15, Oslo 3, Norway  
 Filed Jan. 13, 1975, Ser. No. 540,541  
 Int. Cl.<sup>2</sup> B63B 23/00

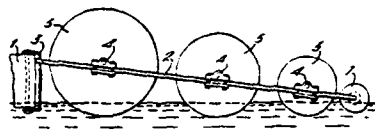
U.S. Cl. 9-41

12 Claims

Boats or the like are hauled up, stored and launched by an arrangement consisting of a frame on which buoyancy elements are mounted. The frame has a vertically movable attachment to a floating or fixed stage, quay, or projection on land. The buoyancy elements are rotatably mounted so that they can freely rotate when the boat is hauled up or launched.

Keywords: Small-craft launcher

U.S. Cl. X.R. 114-5BD



3,977,200  
**LIGHTHOUSE OR BEACON CONSTRUCTION**  
 Mauri Mänttinen, Oulu, Finland, assignor to Oy Yleinen Insinööritoimisto, Helsinki, Finland  
 Filed Feb. 20, 1975, Ser. No. 551,286  
 Claims priority, application Finland, Feb. 25, 1974, 542/74  
 Int. Cl.<sup>2</sup> E02D 21/00

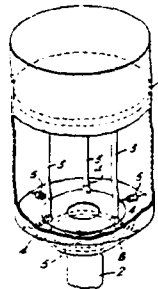
U.S. Cl. 61-86

14 Claims

The invention relate to a lighthouse or beacon construction characterized in that in order to isolate vibrations, the upper part of the construction is not in rigid connection with the lower part subject to forces which cause vibrations, but the construction is broken at a suitable height and the upper part is mounted on the lower part so that it is supported by slide rails, roll rails, wheels, a flexible or pivoted parallelogram mechanism or elastic poles, or a corresponding flexible mechanism, so that the lower part can move substantially horizontally in relation to the upper part while the upper part is maintained in substantially vertical position.

Keywords: Ice protection; Offshore platform, fixed

U.S. Cl. X.R. 9-8P



3,977,344

**FLOATABLE CONCRETE STRUCTURES**

John George Holford, 1350 Winding Trail No. 33, Mississauga, Ontario, Canada

Filed Oct. 7, 1974, Ser. No. 512,898

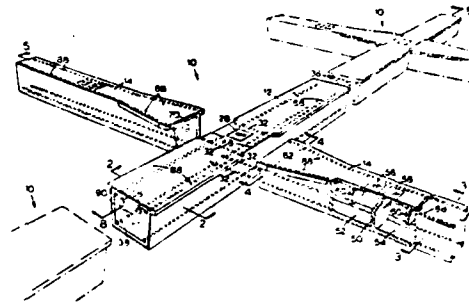
Int. Cl.<sup>2</sup> B63B 35/00

U.S. Cl. 114—5 F

6 Claims

A floatable concrete structure consisting of at least two modular units of concrete are connected together by post-tensioned cables extending longitudinally therethrough. In one method of assembly floatation units are assembled on dry land, floated in a body of water and thereafter connected by means of the tensioning cables to form a floating concrete structure. Resilient bearing pad is disposed between the abutting end faces of the modular units prior to the tensioning of the cables which connect the modular units.

Keywords: Pier, floating; Small-craft pier



3,977,969

**CONTAINMENT AND RIDDANCE OF OIL SPILLS**

David M. Zall, Annapolis, Md., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Oct. 26, 1971, Ser. No. 192,305

Int. Cl.<sup>2</sup> B01D 15/00; C02B 1/14

U.S. Cl. 210—40

4 Claims

The invention is a method of clearing oil spills by chemically treating the surface of the oil spill with a polymer of high molecular weight having jelling properties thereby causing the oil to coagulate. The oil is then easily raked off the surface of the water.

Keywords: Pollutant absorption

U.S. Cl. X.R. 210-DIG.26; 252-316

No Figure



3,978,444

# SEAFLOOR MAPPING SYSTEM

Robert D. Hitchcock, Ventura, Calif., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed May 30, 1975, Ser. No. 582,481

Int. Cl.<sup>2</sup> G01S 9/66, 7/60

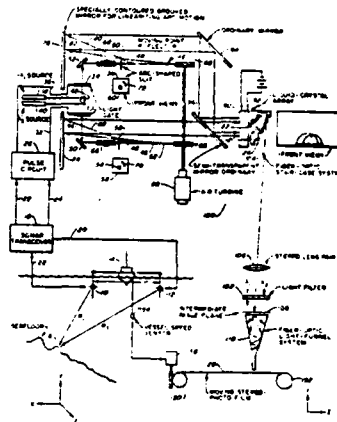
U.S. Cl. 340—3 F

12 Claims

A seafloor mapping system utilizing echo signals from a pair of towed, side-looking sonar transducers to generate in real time a roll of photographic film which after conventional processing can be directly viewed in a stereoscope to produce a three-dimensional illusion of seafloor topography.

Keywords: Seabed site survey; Sonar, side looking

U.S. Cl. X.R. 343-5PC; 343-7.9



3,978,446

# ELECTRET CABLE HYDROPHONE ARRAY

G. Kirby Miller, Saratoga, Calif., assignor to GTE Sylvania Incorporated, Mountain View, Calif.

Filed Aug. 25, 1975, Ser. No. 607,436

Int. Cl.<sup>2</sup> G01V 1/40; H04R 19/00

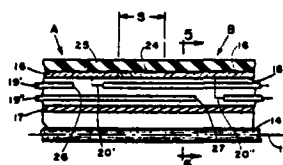
U.S. Cl. 340—7 R

10 Claims

A simplified hydrophone array for use in a towed marine streamer for seismic undersea exploration comprises a longitudinal series of electrically separate sensor sections comprising radially spaced coaxial inner and outer conductors and a plurality of longitudinally extending electret cables tightly fitted in the annular space between the conductors. Each cable has a conductive lead wire insulated by an electret covering, such as electrostatically charged tetrafluoroethylene (Teflon); an electrical signal between inner and outer conductors and across the electret is produced by acoustic energy transmitted to the outer conductor. The outer conductors are electrically insulated from each other and the inner conductor is longitudinally continuous throughout the length of the array and thus is common to all sections. The signal processing apparatus on the towing ship is connected to the individual sections by the lead wires which are connected to the outer conductors, respectively, and by the common inner conductor and so is responsive to the separate transducing actions of the several sections. A waterproof jacket around the outer conductors seals the assembly.

Keywords: Seismic hydrophone array; Seismic streamer cable

U.S. Cl. X.R. 179-111E; 307-88ET



SEPTEMBER 7, 1976

3,978,676

**SHIP LIFTING APPARATUS**

Henry B. Chambers, Santa Inez; Clair W. Tellefson, Santa Barbara, and Tony H. Balsillie, Goleta, all of Calif., assignors to Hydranautics, Goleta, Calif.

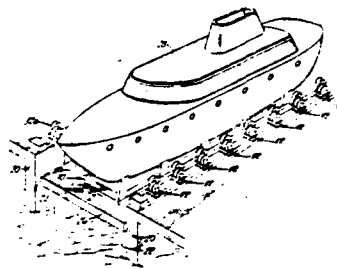
Filed Oct. 28, 1975. Ser. No. 626,078

Int. Cl.<sup>2</sup> E02C 5/00; B66B 9/04; B63C 5/00

U.S. Cl. 61-65 12 Claims

A ship lifting apparatus, or drydock, is formed by a pair of parallel, spaced apart piers which define a slip in which is located a platform on to which a ship can be floated. The platform is raised or lowered by a plurality of chain jacks mounted in aligned rows on each of the piers. One of the chain jacks is a master jack and has chain link-engaging latches controlled by a cam and follower while the other chain jacks are slave jacks being actuated by connection to each other and the master jack by tensioned cables attached to their latch actuating mechanisms.

Keywords: Small-craft launcher; Small-craft service structure



3,978,679

**METHOD AND APPARATUS FOR UNDERWATER TRENCH EXCAVATION AND PIPELINE LAYING**

Claude F. Lecomte, Prairie au Duc, 44040 Nates, France

Filed Jan. 22, 1975. Ser. No. 543,105

Claims priority, application France, Jan. 22, 1974, 74.02077

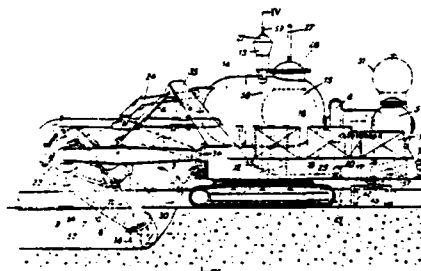
Int. Cl.<sup>2</sup> E02F 5/06; F16L 1/00

U.S. Cl. 61-72.4 23 Claims

In the excavation of a trench on the seabed for receiving a pipeline, the pipeline is first laid on the seabed and subsequently the trench is excavated by an excavation machine which moves along side the pipeline and digs out material from beneath the pipeline. The machine contacts the pipeline to provide a control on the position of the machine relative to the pipeline and is self motivated.

Keywords: Dredge, cutterhead; Dredge, submerged; Seabed pipeline placement; Seabed trencher

U.S. Cl. X.R. 37-58; 37-63



3,978,726

# FLUID CURRENT METER

Hsing-Hua Shih, Bowie, Md., assignor to Westinghouse Electric Corporation, Pittsburgh, Pa.

Filed May 5, 1975, Ser. No. 574,832

Int. Cl.<sup>2</sup> G01D 1/00

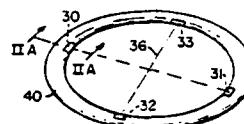
U.S. Cl. 73-189

12 Claims

Two pairs of acoustic transducers are provided for obtaining fluid current velocity measurements. The pairs of transducers are mounted in a supporting ring which introduces a controlled source of error in the measurement process, the configuration however resulting in a nearly constant error regardless of flow direction. The constant error introduced by the ring supporting structure may be easily corrected by a scaling factor in the signal processing circuitry utilized to compute fluid velocity.

Keywords: Current measurement

U.S. Cl. X.R. 73-194A



3,978,813

# PROPELLER-DRIVEN HYDROPHONE ARRAY TENSIONING DEVICE

George O. Pickens, San Diego, and Charles E. Hansen, Chula Vista, both of Calif., assignors to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Jan. 9, 1976, Ser. No. 647,686

Int. Cl.<sup>2</sup> B63B 21/56

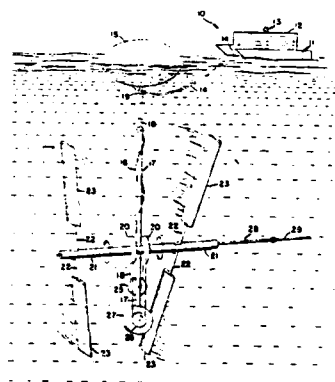
U.S. Cl. 115-6

16 Claims

A tensioning device for submarine oceanographic structures includes a surface float having a pendent line suspended therebeneath and a vertical rod support attached to the distal end of the pendent line. An electrical motor attached to the lower end of the support provides ballast to hold the rod in a substantially vertical position and also provides mechanical motive power to turn two coaxially mounted hydrodynamic screws. These screws are attached to the support so as to provide a propulsive force for the support and surface float system. A hitch employing standard marine hardware connects the tensioning system to an underwater structure such that this propulsive force is used to tension the structure. Power for the electrical motor is provided by a source of electrical power housed in a small surface vessel and effectively connected to the surface float and pendent line.

Keywords: Instrument deployment; Seismic hydrophone array; Towed body depth control

U.S. Cl. X.R. 114-235B



3,978,940

ACOUSTIC SOURCE

John V. Bouyoucos, Rochester, N.Y., assignor to Hydroacoustics Inc., Rochester, N.Y.

Filed Mar. 10, 1975, Ser. No. 557,140

Int. Cl.<sup>2</sup> G01V 1/04; 1/38; H04B 13/02

U.S. Cl. 181-120

20 Claims

A broadband low frequency source suitable for deep sea applications without pressure compensation is disclosed. The source utilizes hydraulically powered flexural disc radiators which are sized to small fractions of the generated wavelength. Inertance is applied hydraulically to the radiators to effectively mass load the radiators, thus lowering the resonant frequency of the radiators to fall within the transmission band to minimize driving power requirements and provide for operation over a wide bandwidth.

Keywords: Seismic vibratory acoustic transmitter

U.S. Cl. X.R. 340-8R; 340-12R; 340-17R



3,979,291

OIL BOOM AND METHOD OF SKIMMING FLOATING OIL FROM THE SURFACE OF A BODY OF WATER

Cornelis in 't Veld, Vlaardingen, Netherlands, assignor to National Marine Service, Inc., St. Louis, Mo.

Continuation of Ser. No. 422,603, Dec. 6, 1973, abandoned.

This application May 30, 1975, Ser. No. 582,271

Claims priority, application Netherlands, Dec. 7, 1972, 7216633

Int. Cl.<sup>2</sup> E02B 15/04

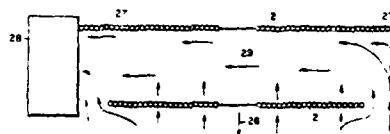
U.S. Cl. 210-84

13 Claims

An oil boom assembly for collecting lighter liquid from the surface of a body of water includes a plurality of elongated, parallel rows of vertical, buoyant, barrier screen members connected together by flexible means and rigidly braced to hold the rows in parallel relationship in upright position when afloat in water. The rows are of progressively longer length and define open channels therebetween for the flow of liquid. A floating liquid diverter means at one end of the boom diverts relatively moving liquid into the channels to cause transport currents to flow therein towards the opposite ends of the channels, where a liquid skimmer means is provided to remove surface water and lighter fluid floating thereon. The progressive barrier lengths permit flow of surface water around the ends of the shorter barriers into the channels between the barriers and may be arranged to cause the diverting of flow around the ends of the shorter barriers into the channels therebetween and towards the skimmer means. A method for collecting lighter liquid using the above apparatus is also disclosed.

Keywords: Pollutant collection; Pollutant, suction removal; Pollutant, surface barrier

U.S. Cl. X.R. 210-DIG.25; 210-2428

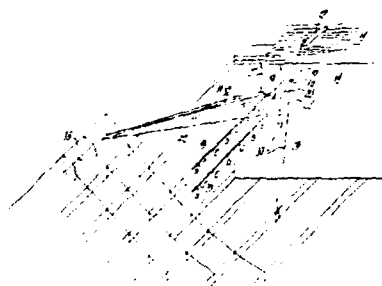


3,979,713  
**METHOD OF MARINE REFLECTION-TYPE SEISMIC  
 EXPLORATION**  
 Alvin L. Parrack, Bellaire, Tex., assignor to Texaco Inc., New  
 York, N.Y.  
 Filed Aug. 19, 1974, Ser. No. 498,787  
 Int. Cl.<sup>2</sup> G01V 1/00; H04B 13/00; H04R 15/00  
 U.S. Cl. 340-7 R 7 Claims

**Keywords:** Seismic survey method

U.S. Cl. X.R. 340-3T

Seismic exploration method applicable to marine surveys. It involves making a dual spread of detectors which are spaced apart vertically. The signals received at one of the spreads are subtracted from corresponding signals received at the other spread. This eliminates horizontally travelling energy signals by cancellation.



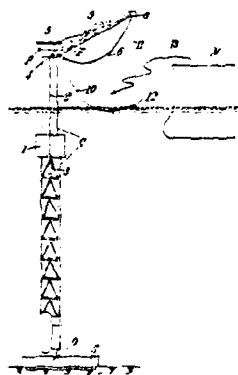
SEPTEMBER 14, 1976

3,990,037  
**APPARATUS FOR MOORING SHIPS**  
 Samuel Tuson, Mesnil-le-Roi, France, assignor to Entreprise  
 d'Equipements Mecaniques Hydrauliques E.M.H., Bou-  
 logne, France  
 Filed Jan. 17, 1975, Ser. No. 541,949  
 Claims priority, application France, Feb. 12, 1974,  
 74.04643  
 Int. Cl.<sup>2</sup> B63B 21/00  
 U.S. Cl. 114-230 8 Claims

**Keywords:** Offshore mooring structure;  
 Offshore platform, floating

U.S. Cl. X.R. 9-8P; 141-388

Mooring apparatus for ships, particularly tankers com-  
 prises a cable which is retractable into a column which  
 is pivotally connected to a base anchored to the sea  
 bed. The cable is retracted by a counterweight or simi-  
 lar device, is withdrawn from the column by traction  
 exerted by the ship being moored, and is arrested by  
 engagement of the counterweight against an upper  
 stop associated with the column.



3,980,559  
**METHOD AND AN APPARATUS FOR COLLECTING  
 SUBSTANCES AND OBJECTS ON A LIQUID SURFACE**  
 Ernst Sune Netzell, Selmedalsvagen 222, 126 58 Hagersten,  
 Sweden

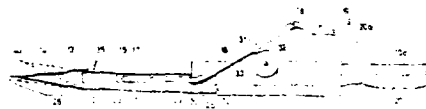
Filed Sept. 9, 1974, Ser. No. 504,221  
 Claims priority, application Sweden, Sept. 10, 1973,  
 7312288

Int. Cl.<sup>2</sup> E02B 15/04  
 U.S. Cl. 210-83 15 Claims

A method and an apparatus for collecting substances and objects floating on a liquid surface, e.g. for collecting oil and oily substances on a water surface. The apparatus performing the method comprises means for separating the upper layer of the liquid and the substances and objects floating in this layer from the rest of the liquid; means for distributing the liquid over a comparatively large collecting area; means for collecting the substances and objects floating in said liquid layer; and means for draining off the cleaned liquid.

Keywords: Pollutant, mechanical removal;  
 Pollutant removal watercraft

U.S. Cl. X.R. 210-242S; 210-DIG.25



SEPTEMBER 21, 1976

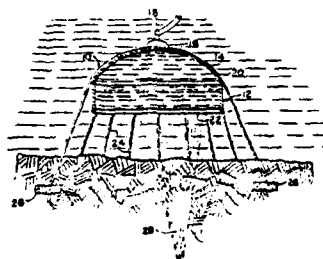
3,981,154  
**SYSTEM FOR RECOVERING PETROLEUM FLUIDS  
 FROM UNDERWATER FISSURES**  
 Charles M. Hix, Jr., Bryan, Tex., assignor to Arcadia Refining  
 Company, Tyler, Tex.  
 Continuation-in-part of Ser. No. 879,653, Nov. 25, 1969, Pat.  
 No. 3,675,427. This application Mar. 27, 1970, Ser. No.  
 23,343

Int. Cl.<sup>2</sup> E02B 15/04  
 U.S. Cl. 61-101 1 Claim

A system for recovering petroleum fluids from underwater fissures, wherein a tank formed of a cylindrical wall having a top closure and an open bottom is adapted to be positioned over the fissure on or near the bed of water without any rigid restraints. The spilled fluids from the fissure will enter the open bottom and pass upwardly toward the top closure where they are stored for later withdrawal. A method for recovering petroleum fluids from underwater fissures.

Keywords: Pollutant collection; Pollutant,  
 submerged barrier

U.S. Cl. X.R. 61-1F



3,981,261

**BOAT DOCKING DEVICE**

Andrew G. Kauffman, 212 Heather Road, Upper Darby, Pa. 19082, and James D. Michelson, 17 Scarlet Ave., Greengridge, Pa. 19014

Filed Aug. 18, 1975, Ser. No. 605,590

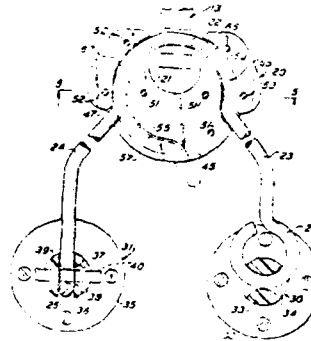
Int. Cl.<sup>2</sup> B63B 21/00

U.S. Cl. 114-230

9 Claims

A boat docking device including a hub and a pair of arms outstanding from the hub and movable toward and away from each other, one arm being permanently swingably attached to a dock and the other removably swingably attached to the dock, the hub including a bolt or shackle extensible through and withdrawable from the bow eye of a boat when the arms are moved away from and toward each other, respectively.

Keywords: Small-craft mooring device



3,981,379

**DEVICE FOR EMITTING MECHANICAL WAVES**

Leon Sayous, Pau, France, assignor to Societe Nationale des Petroles d'Aquitaine, Coubevoie, France

Filed May 30, 1975, Ser. No. 582,241

Claims priority, application France, May 31, 1974, 74.18911

Int. Cl.<sup>3</sup> G01V 1/06, 1/14

U.S. Cl. 181-118

10 Claims

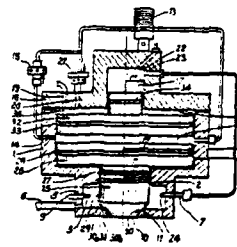
This invention concerns a device for emitting mechanical waves in an external medium.

This device comprises an annular or axial combustion chamber, shut by a valve, and comprising means of introducing fuel and oxidant, and an ignition system; the valve is composed of a differential piston, one side of which forms a mobile wall of a chamber containing fluid under pressure, and part of the other side of which forms a mobile wall of the combustion chamber.

This device is used mainly to generate compression waves for the purpose of seismic exploration.

Keywords: Seismic explosive acoustic transmitter

U.S. Cl. X.R. 181-117; 181-401; 181-402



SEPTEMBER 28, 1976

3,982,401

**MARINE STRUCTURE WITH DETACHABLE ANCHOR**  
John T. Luggins, Metairie, La., assignor to Texaco Inc., New York, N.Y.

Filed Apr. 2, 1975, Ser. No. 564,522

Int. Cl.<sup>2</sup> B63B 35/44

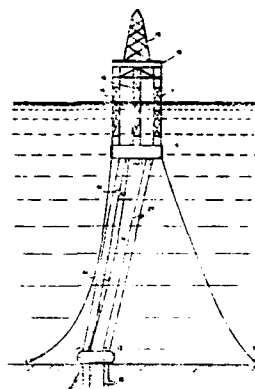
U.S. Cl. 61-93

7 Claims

Semisubmersible marine structure for operation in offshore waters, comprising a work deck which is supported by a buoyant substructure. The latter includes a separably connected anchor unit which can be controllably lowered to the floor of the offshore site and thereafter weighted, to regulate the position of the floatable structure. Tensioning lines extending between the anchor and the structure draw the latter downward below its normal floating disposition. Similarly, outboard anchor lines are actuated to locate the structure laterally with respect to its position over a drill site.

**Keywords:** Offshore platform anchor; Offshore platform, floating

U.S. Cl. X.R. 166-.5; 175-7



3,982,403

**LAYING CABLES AND THE LIKE UNDER WATER**

Norman Howard Waterhouse, Windsor, England, assignor to BICC Limited, London, England

Filed Dec. 4, 1974, Ser. No. 529,565

Claims priority, application United Kingdom, Dec. 6, 1973, 56534/73

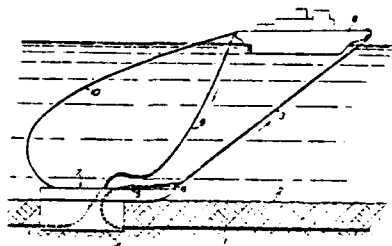
Int. Cl.<sup>2</sup> F16L 1/00; E02F 5/02

U.S. Cl. 61-72.4

10 Claims

A method of laying a flexible member below the bed of a body of water comprising forming a trench in the bed and laying in it a line having a greater strength and/or a lower cost than the flexible member; and then in a separate second operation laying the flexible member from a cable-laying ship in substantially the same trench by submerged apparatus caused to follow the path of the line. Usually the line will be buried before the second operation commences, and the submerged apparatus then takes the form of a submerged plough which re-forms a trench, on substantially the same route as the original trench. The technique allows the flexible member to be laid on a route known to be free of obstruction.

**Keywords:** Seabed cable plow





3,983,034

**APPARATUS AND METHOD OF REMOVING DEBRIS  
FLOATING ON A BODY OF WATER**

Donald E. Wilson, Dhahran, Saudi Arabia, assignor to Chevron Research Company, San Francisco, Calif.

Continuation of Ser. No. 410,122, Nov. 26, 1973, abandoned.

This application Jan. 3, 1975, Ser. No. 538,494

Int. Cl.<sup>2</sup> E02B 15/04

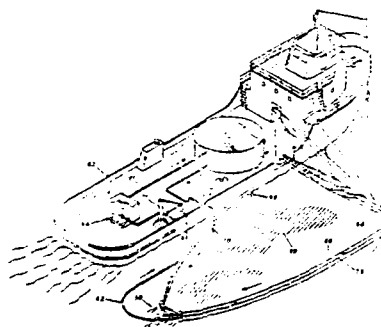
U.S. Cl. 210-73 W

9 Claims

A skimmer for removal of liquid and debris, such as skimming oil spills from water, comprising three pontoons, one located in each of the corners of a triangle made up of interconnecting structural members floating on a body of water. The corner pontoons are adjustably buoyant permitting the skimmer to move vertically up or down as a unit in the water so as to adapt to the wave height of the body of water. At the base of the triangle is the skimmer mouth sloping upward towards a sump. The two pontoons on each side of the sloped mouth have a clamp easily attachable to an oil boom which guides an oil slick into the skimmer. The function of the mouth is to skim off approximately two inches of the water surface. The sloped mouth terminates at an impregnable deflector centrally located between two screens that serve as a wave quieting assembly as well as a separator of debris floating on the water. The skimmed water is then directed through the debris screens into a quieting area. Once in this quieting area, the oil slick flows over a self-adjustable weir into a sump. The weir is made adjustable by a float that modifies the weir elevation with changes of liquid level in the sump. The skimmed liquid is then pumped to a storage tank from which it is recycled by letting the water at the tank bottom flow under gravity back into the oil boom.

Keywords: Pollution, suction removal

U.S. Cl. X.R. 210-83; 210-242S; 210-DIG.25



3,983,404

**SURF-TURBINE GENERATING SYSTEM**

William A. Sherrard, 25 S. Garfield St., Cleona, Pa. 17042

Filed Aug. 22, 1974, Ser. No. 499,559

Int. Cl.<sup>2</sup> F03B 13/10

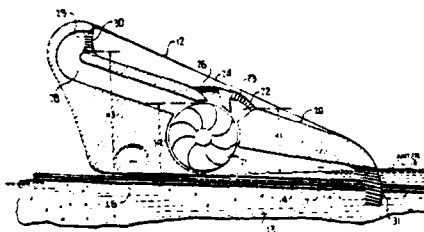
U.S. Cl. 290-53

5 Claims

An electrical generator is powered by the kinetic energy in ocean waves breaking at the shore. Waves are directed up an inclined surface through which an intake port is defined at a level substantially below the average wave height and extending across the entire length of the generator. Water entering the port is directed to drive the blades of a turbine located below the inclined surface but above the normal water level. Water overshooting the port is collected as it flows back down the surface by a second port which similarly feeds the water to drive the turbine. Water overshooting the top of the inclined surface is collected in a flow-reversing channel and likewise directed to drive the turbine. The system is mounted on wheels which are movable on rails extending from the ocean floor onto the beach, whereby the system can be moved to optimum position for different tidal conditions.

Keywords: Electrical generator; Power, wave

U.S. Cl. X.R. 415-4; 417-330



OCTOBER 5, 1976

3,983,705

APPARATUS FOR FORMING A BOTTOM PROTECTION  
Jan de Boer, Waddinxveen, Netherlands, assignor to Zinkcon,  
Maatschappij tot uitvoering van moderne zinkconstructies  
B.V., Werkendam, Netherlands

Filed Mar. 12, 1975, Ser. No. 557,556

Claims priority, application Netherlands, Mar. 15, 1974,  
7403530

Int. Cl.<sup>2</sup> E02D 29/00

U.S. Cl. 61-102

2 Claims

Method of forming a bottom protection by means of  
sunk mattresses around a structure to be lowered in a  
body of water, wherein the mattresses, attached to the  
part of the structure to be placed on the bottom, are  
lowered therewith and are laid out thereon when the  
bottom is reached. The mattresses, each wound  
around a roll and with their free end attached adjacent  
to the lowest part of the structure, are lowered, and on  
arrival on the bottom the rolls are unrolled radially  
from the structure base.

Keywords: Fabric mat; Seabed scour  
protection

U.S. Cl. X.R. 61-1R; 61-38



3,983,707

METHOD AND APPARATUS FOR MOVING AN OBJECT  
ON THE BOTTOM OF A BODY OF WATER

Georgy Mikhailovich Lezgintsev, Leninsky prospekt, 36, kv.  
250; Vladimir Ivanovich Popov, Podmosensky pereulok, 11,  
kv. 14; Stanislav Jurievich Istoshin, Koptevskaya ulitsa, 26,  
korpus 3, kv. 69; Mikhail Anatolievich Belyavsky, ulitsa  
Butlerova, 10, kv. 61, all of Moscow; Igor Nikolaevich Sta-  
shevsky, ulitsa Sosnovaya, 8, kv. 23, Podolsk Moskovskoi  
oblasti, and Igor Parfenovich Timofeev, ulitsa Chaikovskogo,  
79, kv. 39, Leningrad, all of U.S.S.R.

Filed Mar. 5, 1975, Ser. No. 555,619

Int. Cl.<sup>3</sup> B25J 3/00; B63C 11/00; E02F 5/28

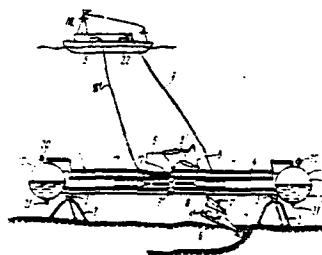
U.S. Cl. 61-69 R

14 Claims

A method for moving an object on the bottom of a  
body of water comprising producing a positive buoy-  
ancy in the region of one of the supports of the object  
to lift the support from the bottom of the body of  
water and then turning the object in the desired direc-  
tion around another of the supports which remains at  
rest on the bottom of the body of water. Upon com-  
pletion of the turning movement of the object, the  
raised support is lowered by producing a negative  
buoyancy in the region of such support. The positive  
and negative buoyancy is produced by means of gas  
and water pumped into containers mounted in the re-  
gion of the supports.

Keywords: Dredge, propulsion; Dredge,  
submerged

U.S. Cl. X.R. 37-56; 115-9



3,983,750

# FLUID LEVEL SENSING DEVICE

James L. Kirkland, 2211 Lombardy Ave., Panama City, Fla. 32401, assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.  
Filed Sept. 29, 1975, Ser. No. 617,609

Int. Cl.<sup>2</sup> G01F 23/28

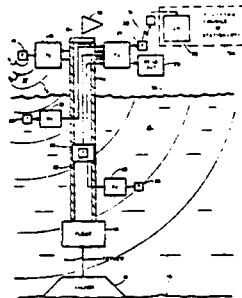
U.S. Cl. 73-170 A

11 Claims

A water wave height and fluid level measuring system is disclosed as having a buoyant support mast which floats partially above water and partially below water in a substantially vertical disposition. A radio frequency transmitter is mounted on said mast above said water, and a plurality of radio frequency receivers are mounted on said mast at spatially disposed positions along said mast and submerged within said water. Telemetering, receiving data processing, and readout means are effectively connected to said receivers for communicating the output signals therefrom to predetermined remote or other locations, with said output signals being analog signals which represent water wave height or other fluid level at any given instant.

Keywords: Buoy, instrumented; Wave measurement

U.S. Cl. X.R. 73-290R



3,983,828

# VERTICALLY MOORED PLATFORM INSTALLATION

Edward M. Stram, San Rafael, Calif., assignor to Standard Oil Company (Indiana), Chicago, Ill.

Filed Jan. 5, 1976, Ser. No. 466,723

Int. Cl.<sup>2</sup> B63B 35/44

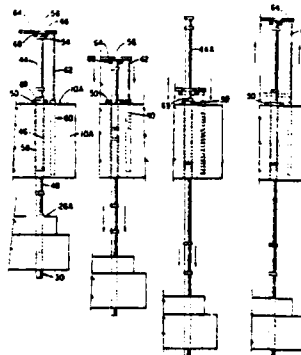
U.S. Cl. 114-5 D

3 Claims

This invention relates to the installation of a vertically moored platform over a selected well site. The platform or structure is supported on a buoyant gravity base and floated to a position over the subsea well site. The gravity base is attached or held to the platform by a plurality of short sections of riser pipes. The gravity base is then ballasted to give it a negative buoyancy. A joint of riser pipe is then added to each of the short riser pipe sections. The gravity base is then lowered by lowering all the riser pipes simultaneously until the top of the newly added joints is reached. Then a second group of riser joints is added and the process repeated until the gravity base has been lowered to the ocean floor. When the gravity base has reached bottom, heavy ballasting material, such as cement slurry, can be added if needed. The riser pipes which were used to lower the gravity base are the riser pipes which anchor the floating platform to the gravity base which serves as an anchor. It is also through these riser pipes that drilling operations are conducted.

Keywords: Offshore construction; Offshore platform anchor; Offshore platform, floating

U.S. Cl. X.R. 61-89; 175-7



OCTOBER 12, 1976

3,984,987  
SILT AND POLLUTION CONTROL FOR MARINE  
FACILITY

Stanley C. Light, Jr., Claymont, Del., assignor to Sun Ship-  
building and Dry Dock Company, Chester, Pa.  
Filed Dec. 24, 1974, Ser. No. 536,073  
Int. Cl.<sup>2</sup> E02B 15/04, 3/04

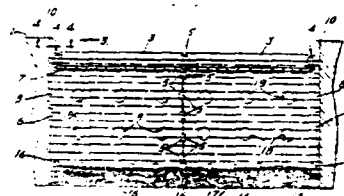
U.S. Cl. 61-1 F

3 Claims

Apparatus for a marine facility prevents silt from entering the facility and also provides spill containment. A floating barrier provides the containment and a flexible curtain attached to the barrier and having devices anchoring the curtain to the floor of the water prevents silt from entering the facility. The barrier rises and falls with the tides and openings in the curtain permits the tidal flow to enter and leave the facility. The apparatus is attached to fixed structure in a suitable manner. The barrier and curtain can be moved to permit passage of a ship.

Keywords: Channel protection; Pier, fixed;  
Pollutant, submerged barrier;  
Pollutant surface barrier

U.S. Cl. X.R. 61-1R; 61-3



3,934,989  
MEANS FOR PRODUCING SUBAQUEOUS AND OTHER  
CAST-IN-PLACE CONCRETE STRUCTURES IN SITU

Lee A. Turzillo, 2078 Glengary Road, Akron, Ohio 44313  
Continuation of Ser. No. 344,695, March 26, 1973, which is a  
division of Ser. No. 44, Jan. 24, 1970, Pat. No. 3,726,950,  
which is a continuation-in-part of Ser. No. 647,026, June 19,  
1967, abandoned, which is a continuation-in-part of Ser. No.  
365,431, May 6, 1964, Pat. No. 3,345,824. This application  
Jan. 17, 1975, Ser. No. 542,050

The portion of the term of this patent subsequent to Oct. 10,  
1984, has been disclaimed.

Int. Cl.<sup>2</sup> E02B 1/00; E02D 5/00, 5/18

U.S. Cl. 61-35

11 Claims

Means for repairing or forming structural bodies of self-hardening fluid cement mortar, in a subaqueous or other situs, utilizing a body-forming cavity including body-shaping walls of porous fabric in combination with openwork matrix means. Fluid mortar or like cementitious material is pumped into the cavity to fill the same and expand the fabric walls against tensional restraint of the fixedly maintained matrix means. Pressure of fluid material may be continued against restraint of the matrix means until small proportions of the fluid material ooze through the porous fabric, which indicates attainment of a lower water-cement ratio in the formed body, after which the fluid material is allowed to set and harden to such given formed shape.

Keywords: Breakwater, concrete; Concrete  
form; Fabric mat; Offshore con-  
struction; Pile, concrete;  
Seawall; Structure repair

U.S. Cl. X.R. 52-169R; 52-742; 61-39; 61-45C;  
61-50; 61-53.52; 61-54; 61-56; 61-100; 249-1



3,984,991

# ANCHOR AND METHOD OF SETTING ANCHOR

Edmond Kagler, Jr., Houston, Tex., assignor to A-Z International Tool Company, Houston, Tex.

Filed Mar. 17, 1975, Ser. No. 559,054

Int. Cl. B63B 21/00, E02D 5/54, E21B 7/12

U.S. Cl. 61-99

12 Claims

An anchor which includes a tubular body, a top closure and a bottom closure secured to opposite ends of said tubular body, a plurality of drilling cutters mounted on the bottom closure, a neck having an external groove therein secured to the top closure, an opening in both the top and bottom closures, means for coaxing with a drill string extending into said closures for sealing to maintain the interior of said body substantially free of water when submerged, a ratchet collar adapted to coact with a mating ratchet collar of the drill string for rotating the anchor to cause it to drill into the bottom of a body of water, a swivel adapted to be lowered onto the neck of the top closure when it has been set, latching dogs engaging in the external groove to secure the swivel to the body, and floatation means for signaling the surface that the swivel is set. The method of setting an anchor assembly including the steps of lowering an anchor body having cutters on the bottom thereof on the end of a drill string extending through the top of the anchor body and into the bottom for circulation of drilling fluid onto the face of the formation being drilled, the drill string being sealed to the anchor body to prevent entry of water therein, rotating the drill string and anchor body to drill the hole and lower the anchor body into the hole simultaneously, cementing around the

Keywords: Embedment anchor; Offshore platform anchor

U.S. Cl. X.R. 61-53.68; 175-7

exterior of the anchor body, then cementing the interior of the anchor body, lowering a swivel onto the top of the anchor body and signaling the seating of the swivel. This abstract is neither intended to define the invention of the application which, of course, is measured by the claims, nor is it intended to be limiting as to the scope of the invention in any way.



3,985,199

# APPARATUS FOR TIMING THE FIRING OF ENERGY SOURCES

George Charles Baird, Orpington, England, assignor to Seismograph Service Corporation, Tulsa, Okla.

Filed Sept. 19, 1974, Ser. No. 507,430

Claims priority, application United Kingdom, Sept. 20, 1973, 44248/73

Int. Cl. G01V 1/38

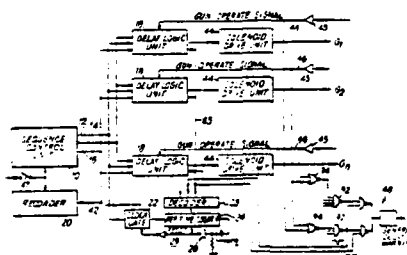
U.S. Cl. 181-107

17 Claims

Apparatus for effecting and controlling the firing of energy sources, particularly is seismic work, includes means for automatically correcting the delays between the desired and actual firing times which may be different for different sources. These means comprise a number of programmable counters for initiating the firing of different sources, a reference time counter to indicate the desired firing time or times and comparator means responsive to differences between actual and desired firing times to cause the programmable counters to bring the actual firing times towards the desired firing times.

Keywords: Seismic acoustic transmitter array; Seismic explosive acoustic transmitter

U.S. Cl. X.R. 181-111; 235-92PE; 235-92T



OCTOBER 19, 1976

3,986,367

**EARTHQUAKE-RESISTANT ANCHORING SYSTEM**

Alexanders K. Kalpins, 501 Fifth Ave., Suite 1201, New York, N.Y. 10017

Filed Oct. 1, 1975, Ser. No. 618,493

Int. Cl.<sup>2</sup> E02D 27/34, 27/50

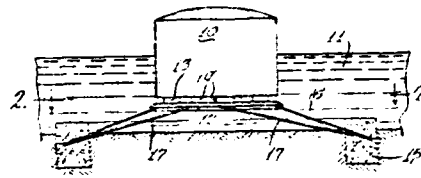
U.S. Cl. 61-100

11 Claims

A structural body such as a nuclear power plant, or the like, can be anchored in an earthquake-resistant manner by supporting the structural body onto a support means so that relative horizontal movement between the body and the support means can take place in all directions. Frictional force generated between the structural body and the support means is less than the force required to move the structural body together with the support means when the latter is subjected to a force having a horizontal component.

**Keywords:** Offshore platform anchor

U.S. Cl. X.R. 52-167



3,986,368

**LOAD EQUALIZING AND SHOCK ABSORBER SYSTEM FOR OFF-SHORE DRILLING RIGS**

Clarence W. Livingston, Orange, Tex., assignor to Livingston Shipbuilding Company, Orange, Tex.

Filed May 27, 1975, Ser. No. 581,107

Int. Cl.<sup>2</sup> E02B 17/04

U.S. Cl. 61-91

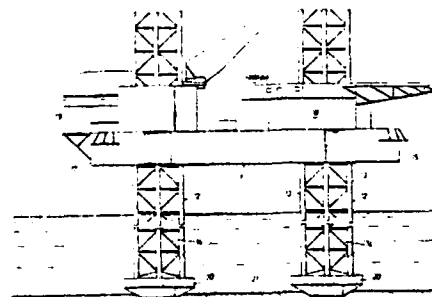
10 Claims

A load equalizing system for a jack-up leg on a mobile off-shore drilling platform barge, wherein the leg has a plurality of rigidly interconnected generally parallel chords. Each of the chords is connected to the barge by a rack and pinion type jack assembly arranged for raising and lowering the leg relative to the platform and wherein lateral deflection of the leg by wave action or the like causes the chords to move vertically unequally relative to the barge. The improvement comprises a pair of hydraulic cylinder assemblies mounted between each of the jack assemblies and the barge, with the working axes thereof generally parallel with the longitudinal axis of the leg. Each cylinder assembly has a cylinder piston mounted therein and a piston rod connected to the piston and extending longitudinally therefrom. Each of the hydraulic cylinder assemblies has one end connected to the barge and the other end arranged for vertical bearing against the top of one of the jack assemblies. Conduit means are provided for interconnecting the fluid containing ends of the cylinders for permitting hydraulic fluid to be transmitted therebetween. Means are also provided for charging hydraulic cylinders with at least sufficient hydraulic fluid to maintain the piston rods at about mid-stroke, whereby unequal vertical loads on the chords are reduced by equalization of hydraulic pressure in the cylinders through the conduit means. In the shock absorbing mode, the system includes a plurality of accumulators, each of which is arranged for containing a quantity of gas. Second conduit means are

**Keywords:** Offshore platform, jack up;  
Offshore platform, leg

U.S. Cl. X.R. 61-92; 254-105

arranged for interconnecting the cylinders with the accumulators. Means are also provided for pressurizing the accumulators with gas whereby shock force exerted on the leg, as would be caused by heaving of the barge during raising and lowering of the leg, are absorbed by displacement of hydraulic fluid from the cylinder to the accumulators and compression of the gas therein.



3,986,959

**OIL SPILL APPARATUS**

Harold E. Bagot, 221 Bennett Ave., Yonkers, N.Y. 10701, and  
Seimes Paul Funkhouser, 79th St. Boat Basin, New York,  
N.Y. 10924

Filed May 21, 1975, Ser. No. 579,681

Int. Cl.<sup>2</sup> E02B 15/04

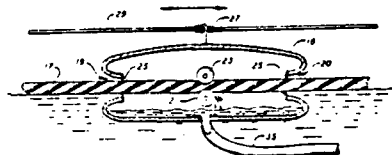
U.S. Cl. 210—242 AS

5 Claims

An improved method and apparatus for removal of oil products floating on water in which a floating sponge remains essentially fixed on top of the water and buoyant squeezing means are moved over said belt to squeeze out oil picked up thereby without having to lift the sponge from the water.

**Keywords:** Pollutant absorption; Pollutant collection; Pollutant removal watercraft; Pollutant, suction removal

U.S. Cl. X.R. 114-.5RC; 210-DIG.26



OCTOBER 26, 1976

3,987,636

**METHODS AND APPARATUS FOR ANCHORING A SUBMERGED STRUCTURE TO A WATERBED**

Stanley J. Hruska, and Albert M. Koehler, both of Houston, Tex., assignors to Brown & Root, Inc., Houston, Tex.

Filed Apr. 30, 1975, Ser. No. 573,024

Int. Cl.<sup>2</sup> E02B 17/00; E02D 5/30, 5/44

U.S. Cl. 61—100

10 Claims

An offshore tower is anchored to a water bed by inserting piling elements into piling jackets located at the tower base and driving the piling elements into the water bed. Grouting material is poured between each jacket and piling element to bond these members together. Grouting material is also poured into the tubular piling elements and into a bell-shaped cavity located therebelow to form a bell footing which anchors the piling element to the water bed. A metallic reinforcement tube which is at least one-half the diameter of the piling element, is inserted into the piling element so as to extend between the piling element and the bell footing. The reinforcing tube presents considerable grouting-encased surface area extending between the piling element and the bell footing to maximize the connection therebetween. In addition, the reinforcing tube effectively reinforces the grouting material against tension, compression, and torsion. Spirally arranged weld beads are affixed to the piling jacket, the piling element, and the reinforcing tube. These weld beads become embedded within the hardened grouting material to firmly secure the tubular elements against longitudinal movement.

**Keywords:** Grouting; Offshore platform, fixed; Offshore platform, leg; Pile footing; Pile, structure connection; Seabed foundation

U.S. Cl. X.R. 61-50; 61-53.52; 61-53.6



3,987,638

**SUBSEA STRUCTURE AND METHOD FOR INSTALLING THE STRUCTURE AND RECOVERING THE STRUCTURE FROM THE SEA FLOOR**

Joseph A. Burkhardt, New Orleans; William D. Loth, Covington, both of La., and Martin O. Parrison, Palos Verdes Estates, Calif., assignors to Exxon Production Research Company, Houston, Tex.

Filed Oct. 9, 1974, Ser. No. 513,429

Int. Cl.<sup>2</sup> E21B 43/01, B01D 19/00

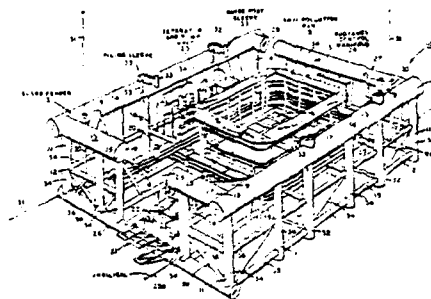
U.S. Cl. 61-88

24 Claims

A structure or template forms a tubular support structure for subsea equipment used in drilling and producing offshore oil and/or gas wells. The template contains production manifolding, remote and safety shut-in control, pump-separator, and pipeline connector subsystems. Certain of the structural tubes are segregated to form compartmented ballast chambers capable of being selectively flooded and dewatered. Certain other structural tubes form piling sleeves. The truss or framework of structural tubes include vertical and horizontal tubes, the latter forming circumferential members as well as interstitial supports. The uppermost of the circumferential members or "ring" also functions as a fender to protect the equipment within the template. The template is made negatively buoyant upon launch by flooding the compartmented ballast chambers, keelhaunched (swung to a position underneath the keel of the drilling vessel), and then lowered to the subsea floor. Once it is positioned on the sea floor the subsea structure is oriented, pile founded and leveled. The template functions as a drilling and casing guide frame ensuring that drilled wells are connectable to the preinstalled manifolding. The template is recoverable by severing the piles and deballasting the compartmented ballast chambers.

Keywords: Grouting; Offshore construction; Pile placement; Seabed foundation; Seabed oil, process structure

U.S. Cl. X.R. 61-1F; 61-50; 61-69R; 61-97; 166-5; 175-9



3,988,592

**ELECTRICAL GENERATING SYSTEM**

William H. Porter, 355 Westbourne St., La Jolla, Calif. 92037

Filed Nov. 14, 1974, Ser. No. 523,579

Int. Cl.<sup>2</sup> F03B 13/12

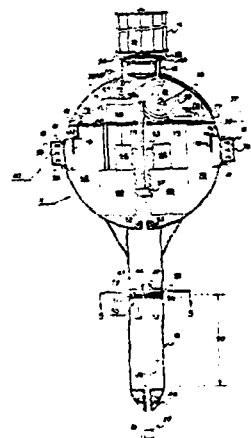
U.S. Cl. 299-53

6 Claims

An electrical generating system in which a hermetically sealed flotation sphere, preferably constructed of plastic, is anchored to a sea bed. The sphere carries a circumferential fender on the outside thereof in which is located a plurality of screws open to sea water which generate electricity from the action of ground swells. A wind turbine is mounted on top of the sphere for generating electricity from wind action and a solar generator is disposed directly beneath the wind turbine and on the upper surface of the sphere for generating energy from solar heat. An air compressor is disposed beneath the sphere for generating electricity from tidal action.

Keywords: Electrical generator; Power, tide; Power, wave; Pump

U.S. Cl. X.R. 417-330





NOVEMBER 2, 1976

3,988,843

**MINING TRANSITION CHAMBER**

Frank Howard Brockett, III, Bellevue, Wash., assignor to The International Nickel Company, Inc., New York, N.Y.

Filed Dec. 11, 1974, Ser. No. 531,753

*Disclosure was also published under second Trial Voluntary Protest Program on Mar. 2, 1976*

Int. Cl.<sup>2</sup> E02F 3/92

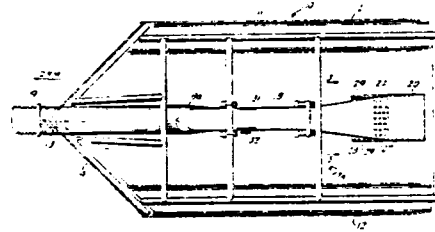
U.S. Cl. 37-57

10 Claims

Improvement in undersea mining apparatus, of the kind wherein a hydraulic suction conduit riser is towed from a forwardly moving surface ship while a mixture of liquids and sea-floor solids (such as sea water and manganese nodules) is gathered at the deep sea floor and transported to the sea surface in a liquid-solids flow pumped up through the riser, comprises liquid-solids flow transition chamber that is connected to riser by an intermediate conveyance duct and towed along the undersea floor to gather and transmit solids from undersea floor to riser. Transition chamber has three mutually communicating openings: a forward-facing entrance for gathering sea floor solids, a rearward-facing entrance for admitting a hydraulically induced flow of sea water and a forwardly upward-facing exit port joined with the conveyance duct to direct transmission of liquid-solids mixture flow from chamber into conveyance duct. Chamber can be mounted as a tail pipe suspended from framework of vehicle having runners for sliding along undersea floor with forward entrance held near floorline.

**Keywords:** Dredge, suction; Dredge intake

**U.S. Cl. X.R. 37-58; 37-DIG.8; 302-15**



3,938,898

**PIPELINES AND MARINE PLATFORMS**

Ronald D. McDonald, N. Vancouver, Canada, assignor to Intercontinental Marine Development Ltd. and The Laird Group Limited, both of, England

Filed Dec. 26, 1974, Ser. No. 536,657

Int. Cl.<sup>2</sup> B63B 21/00; E21B 17/00

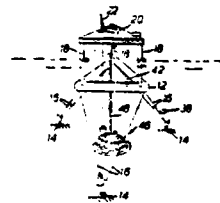
U.S. Cl. 61-98

3 Claims

A marine platform is described incorporating a submerged buoyancy chamber which is anchored to drilled piles in the sea bed by cables. Each anchorage point lies inside a working chamber mounted on the pile to enable workmen inside the chamber to release the coupling between the cable and the pile when the cable needs to be replaced. The buoyancy chamber and the working chamber both have airlocks to enable the transfer of workmen between each chamber and a submersible craft. The buoyancy chamber supports a deck which lies above sea level. The deck is in fluid communication with a wellhead on the sea bed by means of risers. Each riser incorporates two concentric tubes. The inner tube carries oil from the wellhead and the other tube contains a hydraulic fluid through which valves at the wellhead can be controlled from the deck such that the valves close if riser rupture releases hydraulic pressure.

**Keywords:** Offshore platform anchor; Offshore platform, floating

**U.S. Cl. X.R. 61-69R; 166-.5**



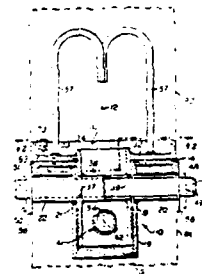
3,988,899  
**PILE JOINER FOR CONNECTING THE ENDS OF  
 CONCRETE PILES AND ITS MEMBERS**  
 John J. Dougherty, Cedar Grove, N.J., assignor to APF Corpo-  
 ration, Clifton, N.J.  
 Filed July 1, 1975, Ser. No. 592,189  
 Int. Cl.<sup>2</sup> E02D 5/30, B25G 3/00  
 U.S. Cl. 61-53 25 Claims

A pile joiner is disclosed for connecting together the ends of concrete piles which joiner includes a socket member and a mating member one of which is on the end of one pile and the other is on the end of the pile to be connected therewith. Each of these two members has a base plate with a central hole therethrough and a tubular element secured to each base plate and extending at right angles thereto. One tubular element is a socket element and the other is a mating element which is received within the socket element. The socket element and the mating element have at least a first sleeve means which includes a sleeve hole or holes through a wall or walls of each element and in alignment when the members are assembled together, an outer sleeve for each sleeve hole of the socket element extending outwardly and an inner sleeve for the sleeve hole or holes of the mating element extending inwardly or between sleeve holes in opposite walls thereof. When the two members are assembled together with their base plates in contact, the first sleeve means of each member or element are in alignment and receive a lock bar to retain the two members and their piles together against separation. Preferably the tubular socket element and the tubular mating element have a second sleeve means similar to the first which are in alignment when the two members are assembled together and preferably angularly located with respect to the first sleeve means. A second lock

Keywords: Pile, concrete; Pile section connection

U.S. Cl. X.R. 61-56; 403-379

bar is received therein to additionally secure the two members and the ends of the piles together. The pile joiner is constructed so that it is suitable for piles of different forms in cross section and for a wide range of sizes of piles. The invention includes each member individually as well as the members in combination as a pile joiner.

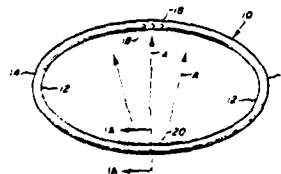


3,988,932  
**OIL SLICK SAMPLING APPARATUS AND METHOD**  
 Robert E. Baier, Buffalo, and Alfred Wright, North Tonawanda, both of N.Y., assignors to Calspan Corporation, Buffalo, N.Y.  
 Filed May 16, 1975, Ser. No. 578,281  
 Int. Cl.<sup>2</sup> G01N 1/00  
 U.S. Cl. 73-421 R 4 Claims

An oil slick sampling apparatus and method wherein a substantially annular hoop-like frame adapted to float on water and surround the slick, has an inner annular surface coated with a surface active material which functions by spreading to compress the area of the oil slick. According to one embodiment the frame is hollow and has one or more openings to collect the oil slick as it is compressed by the inwardly spreading area of the surface active coating; according to a second embodiment the frame is impervious and the slick is compressed by the surface active material inwardly toward a central area thereof whereat suitable collecting means is located to collect the oil slick for further analysis.

Keywords: Pollutant measurement; Sampler, surface

U.S. Cl. X.R. 210-DIG.27



3,989,951

WAVE ENERGY POWER GENERATING BREAKWATER  
Laban E. Lester, and Robert Etkins, both of Crofton, Md.,  
assignors to Westinghouse Electric Corporation, Pittsburgh,  
Pa.

Filed Apr. 29, 1973, Ser. No. 572,816

Int. Cl.<sup>2</sup> F03B 13/10, 13/12

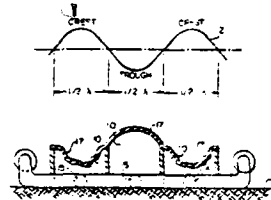
U.S. Cl. 290-53

4 Claims

A breakwater apparatus for generating electrical power by extracting energy from sea waves. A novel array of subsurface fixed-position flexible-walled pneumatic bags or cells, in a closed cycle system, react to surface-wave-correlated static pressure variations by expiring compressed gas into a supply header to a generator-driving pneumatic motor while simultaneously inspiring return gas in a return header from such motor. Alternate inspirational-expirational operation of individual cells involves use of a supply check valve at each cell, discharging into the supply header, and a return check valve at each cell, receiving from the return header.

Keywords: Electrical generator; Power, wave; Pump

U.S. Cl. X.R. 92-90; 417-330



3,990,034

TOWABLE VLF SONAR PROJECTOR

Frank R. Abbott, San Diego, Calif., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Apr. 23, 1975, Ser. No. 570,674

Int. Cl.<sup>2</sup> G01V 1/00

U.S. Cl. 340-7 R

23 Claims

A transverse variable reluctance transducer of acoustic energy is configured to lend itself to being towed through the water while it radiates acoustic energy. Its elongate, cylindrical shape, which has an axial tunnel running its length, allows the flow of cooling water to prevent excessive heat from building up. The transducer's linear vibrator motor has its outer shell windings DC excited while the inner core or reciprocator has its windings AC excited. As the AC source is changed from one frequency range to another, responsive changes in the projected acoustic signal are radiated from suitably interconnected projection surfaces. In one configuration, one of the projection surfaces is in communication with the fluid flowing through the axial tunnel at one end of the transducer and another projection surface faces radially outwardly from the transducer's opposite end. Another configuration has both of these projection surfaces facing radially outwardly at opposite ends of the transducer. In both of these configurations the projection surfaces do not interfere with the towing or the cooling of the transducer. Both of these transducers have projection surfaces which are uniquely coupled to the vibration

Keywords: Seismic vibratory acoustic transmitter

U.S. Cl. X.R. 181-113; 340-8R

motor so as to magnify the amplitude of their radial displacement with respect to the axial excursions of the motor. Another variation of this inventive concept employs the same motor with the reciprocator coupled to one side of a series of axially aligned discs while the stator is coupled to the other side.

No Figure

NOVEMBER 9, 1976

3,990,247

**SYSTEM OF STRUCTURES TO RESIST HYDRODYNAMIC FORCES**

Robert Q. Palmer, 410 Falcon Lane, Las Vegas, Nev. 89107  
Continuation-in-part of Ser. No. 426,122, Dec. 19, 1973,  
abandoned. This application Jan. 21, 1975, Ser. No. 542,788  
Int. Cl.<sup>2</sup> E02B 3/04, 3/14

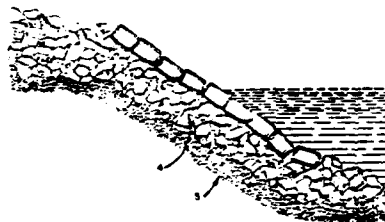
U.S. Cl. 61-4

10 Claims

A protective armor layer for revetments which includes a plurality of components arranged in a close-fitting substantially uniformly patterned single layer for placement on an embankment with the axes of the components substantially perpendicular to the embankment and with a tie-rod through diagonal rows of the components at eyelets in the components. A component is comprised of a short cylindrical tube having a length of about one-half of the outside diameter and a wall thickness of about one-tenth the outside diameter.

**Keywords:** Concrete armor unit; Revetment

U.S. Cl. X.R. 61-37



3,990,252

**EARTHWORKS CONSOLIDATION SYSTEM**

Lester Richard Loudon, Houston, Tex., assignor to Dresser Industries, Inc., Dallas, Tex.

Filed Mar. 19, 1975, Ser. No. 560,019

Int. Cl.<sup>2</sup> E02D 21/00

U.S. Cl. 61-100

15 Claims

An earthworks is constructed by consolidating solids and/or slurries and using the consolidated material for constructing the earthworks. A quantity of less than 150 grams of hydraulic cement and a quantity of soluble alkali metal silicate containing less than 11 grams of  $\text{SiO}_2$  are mixed with each liter of the solids and/or slurry to produce a water insoluble solidified material. The material thus produced is used for the construction of the earthworks. The material can be worked in with other solids, the material will not leach chemicals and the material does not break down into colloidal size particles that would remain suspended in water.

**Keywords:** Offshore construction; Offshore island; Sandbag; Seabed soil treatment

U.S. Cl. X.R. 61-36A; 61-50



3,990,253

# METHOD FOR CONSTRUCTING AN ICE PLATFORM

James F. Lea, Jr., and Joseph E. Zupanick, both of Richardson, Tex., assignors to Sun Oil Company (Delaware), Dallas, Tex.

Filed June 19, 1975, Ser. No. 588,253

Int. Cl.<sup>2</sup> E02D 5/22; E02B 17/00

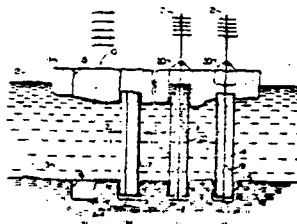
U.S. Cl. 81-103

8 Claims

A work platform for oil drilling, oil production, or other purposes is constructed in arctic waters by locating a natural ice island of suitable area and thickness, and moving it to the desired platform location. The ice island is anchored to the sea floor by installing at least one, but preferably a number of, generally cylindrical sheaths beneath it which extend from the island to the sea floor below. The sheaths are filled with water, and a thermosiphon is installed interiorly of the sheath. As the thermosiphon extracts heat from the water within the sheath, the water is converted to ice, and eventually the entire body of water within the sheath is frozen, thereby forming a column of ice which anchors the island to the sea floor in the desired location.

Keywords: Offshore platform, fixed; Offshore platform, leg; Ice structure

U.S. Cl. X.R. 61-53; 62-260; 165-45



3,990,254

# MARINE STRUCTURE FOR OFFSHORE ACTIVITIES

Olav Mo, Gressundveien 94, Nesbru, Norway

Filed Mar. 27, 1975, Ser. No. 562,398

Claims priority, application Norway, Mar. 29, 1974, 1145/74; Dec. 3, 1974, 4362/74

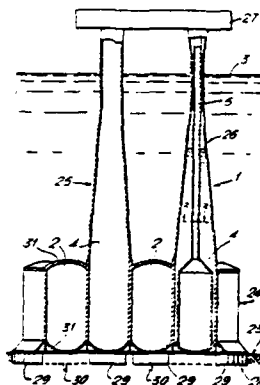
Int. Cl.<sup>2</sup> E02B 17/00

U.S. Cl. 61-101

11 Claims

A marine structure for the handling of liquids such as hydrocarbons comprises a substructure including a plurality of cells. A watertight superstructure extends upwardly from at least one but preferably some of the cells to a height above sea level whereat it supports a deck structure. Within one of the cells which includes a superstructure a column is formed, which column extends upwardly from the bottom of the cell to a substantial height, preferably above sea level, and is arranged such that at least an upper portion of the space within the column located below sea level is kept dry so that machinery or the like can be stored thereat. Pipes extending upwardly from the cells can be formed integrally with and even in the walls of the column. The column may extend all the way to the deck.

Keywords: Offshore platform, fixed; Offshore platform, leg; Seabed oil, process structure



3,990,377

**SELF-PROPELLED MACHINE FOR SEA-BED WORK**  
Jean-Pierre G. Marquinez, Marseille, France, assignor to SA  
Compagnie Maritime d'Expertises Comex, Marseilles,  
France

Filed July 7, 1975, Ser. No. 593,471

Claims priority, application France, July 19, 1974,  
74.25602

Int. Cl.<sup>2</sup> B63G 8/00

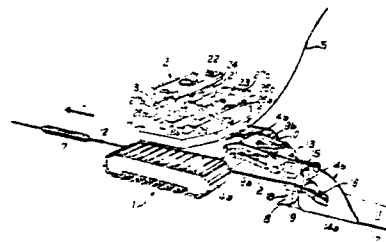
U.S. Cl. 114—16 R

16 Claims

This invention relates to a self-propelled machine piloted by operators and working on the sea-bed, such machine comprising on the one hand a self-propelled chassis, comprising an electrically powered hydraulic pumping system driven by a submersible motor fed through a cable connecting the chassis to the surface and, on the other hand, a submarine which fixes itself on a platform connected to the self-propelled chassis, and in which submarine the operators are installed. The platform comprises ramps for precentering and centering the submarine. The submarine is fixed temporarily on the platform by electromagnets, and induction coils enable orders to be transmitted between the submarine and the self-propelled chassis.

Keywords: Seabed cable plow

U.S. Cl. X.R. 61-72.4



3,990,379

**DREDGING APPARATUS**

Peter Szamosi, Rotterdam, Netherlands, assignor to N.V. Industriële Handelscombinatie Holland, Rotterdam, Netherlands

Filed Feb. 24, 1975, Ser. No. 552,122

Int. Cl.<sup>2</sup> B63B 35/00; E02F 3/88; B65H 75/34

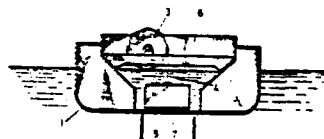
U.S. Cl. 114—36

5 Claims

A marine dredging apparatus has a dredging aggregate that is connected to the surface by means of a plurality of articulatedly interconnected rigid pipe sections that can be wound up on a prismatic reel that in turn is disposed on, in or around a vessel. To facilitate winding in a helical configuration, the axis of the prismatic reel is disposed at an angle to the horizontal.

Keywords: Dredge, suction; Dredge pipe

U.S. Cl. X.R. 37-58; 37-72; 61-107; 175-103;  
242-54R



3,990,386  
**FAIRED MULTI-STRENGTH MEMBER TOWCABLE AND  
 ASSOCIATED SEQUENTIAL LOAD DISTRIBUTION  
 SYSTEM**

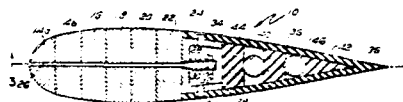
William F. Wardle, Mystic, Conn., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.  
 Filed May 23, 1975, Ser. No. 580,436  
 Int. Cl.<sup>2</sup> B63B 21/56

U.S. Cl. 114-235 F 5 Claims

A towing system has a faired multi-strength member towcable and an associated load distribution system. The load distribution system has a plurality of hydraulic cylinders, rods, springs, frames and check valves operating in conjunction with each other such that small tensile loads are applied to one or a small number of strength members. If the load increases additional strength members are sequentially loaded to distribute the applied force.

Keywords: Towing cable

U.S. Cl. X.R. 254-190R



3,990,970  
**ABSORBENT PRODUCTS FOR HYDROCARBONS**  
 Pierre Porte, Sainte-Foy-les-Lyon, France, assignor to Societe Rhodiaceta, Paris, France  
 Continuation of Ser. No. 175,755, Aug. 27, 1971, abandoned, which is a continuation of Ser. No. 888,046, Dec. 24, 1969, abandoned. This application July 25, 1975, Ser. No. 599,023  
 Claims priority, application France, Dec. 30, 1968, 68.181947

Int. Cl.<sup>2</sup> C02B 9/02  
 U.S. Cl. 210-36 2 Claims

A pulp, i.e. an amorphous mass obtained by precipitation by means of a non-solvent, of an artificial or synthetic polymer, preferably a polyamide or polyester, is used as an absorbent for oil floating on water. Advantageously the pulp is coated with 1 to 5% of its weight of a hydrophobic and oleophilic material, especially a long chain paraffin or chlorinated paraffin.

Keywords: Pollutant absorption

U.S. Cl. X.R. 210-40; 210-DIG.26

No Figure

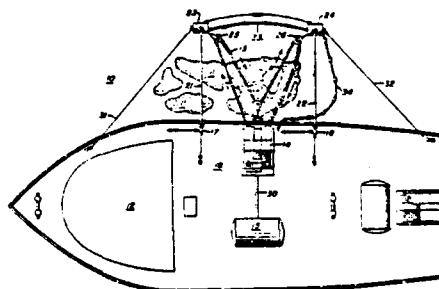
3,990,975  
**RIGGING SYSTEM FOR AN ENDLESS OIL MOP**  
 Charles McLellan, Slidell, La., assignor to Oil Mop Inc., Belle Chasse, La.  
 Filed Aug. 4, 1975, Ser. No. 601,934  
 Int. Cl.<sup>2</sup> E02B 15/04

U.S. Cl. 210-242 AS 3 Claims

The present disclosure is directed to a rigging system for causing an endless oil mop driven through an engine or motor driven wringer mechanism to make multiple passes over and through an oil contaminated body of water from the deck of a vessel. This is accomplished by using sampson posts on the deck of a vessel and connecting spars to the posts and buoyantly supporting the free ends of the spars and mounting mop pulleys at the end of each spar and one pulley between the spars on the side of the vessel at the water line.

Keywords: Pollutant absorption; Pollutant, mechanical removal

U.S. Cl. X.R. 210-DIG.26



381

NOVEMBER 16, 1976

3,991,563

HYDROELECTRIC POWER PLANT

Charles Peim, R.R. 1, Box 1460, Eastbound, Wash. 98245  
Filed Mar. 12, 1975, Ser. No. 557,617  
Int. Cl.<sup>2</sup> F16D 33/00

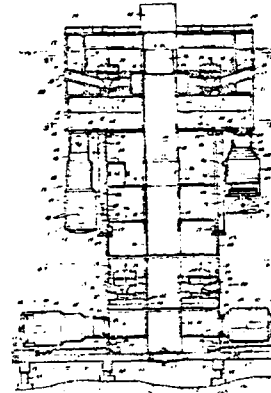
U.S. Cl. 60-325

12 Claims

Keywords: Electrical generator; Offshore platform, fixed

U.S. Cl. X.R. 60-398; 290-1R; 290-4R

The housing of the power plant defines a chamber at a level below the surface of a surrounding body of water; and also a series of penstocks which open into the water at points between the level of the chamber and the surface of the water, and which discharge into the chamber. The hydroelectric power generating means in the plant include turbines in the penstocks, and means for discharging the tailwater from the respective turbines including nipples on the housing which communicate with the chamber and open into the body of water at levels below that of the chamber. The nipples have open ended thimble-like vessels telescopically engaged thereon, to be extended and retracted in relation to the respective nipples axially thereof; and the nipples and vessels have float operated check valves therein adjacent the chamber and the end openings of the vessels, respectively, each of which is adapted to permit flow in the direction relatively from the chamber toward the body of water when open, and to prevent flow in the opposite direction when closed. Also, there are additional valve means in the tailwater discharge means which are adapted to equalize the pressure in the vessels with that in the body of water when the respective check valves in the vessels are closed. Drive means operate to extend and retract the respective vessels, and there are control means connected to the drive means, which are operative through the same (1) to extend and retract the respective vessels in staggered sequence about the circumference of the housing, with each vessel undergoing an at-rest period between the respective extraction and extension stages thereof when the vessel is fully retracted, and (2) to control the rate of extension and retraction of the respective vessels, and the length of their respective rest periods, as a function of the water level in the chamber. Each of the vessels is adapted in buoyancy to hover in equilibrium in the body of water when at rest, and the number of nipples and vessels is adapted in relation to the number of penstocks and turbines so that the vessels collectively discharge the tailwater from the turbines at a rate adapted to maintain the water level in the chamber between predetermined limits.





AD-A080 797

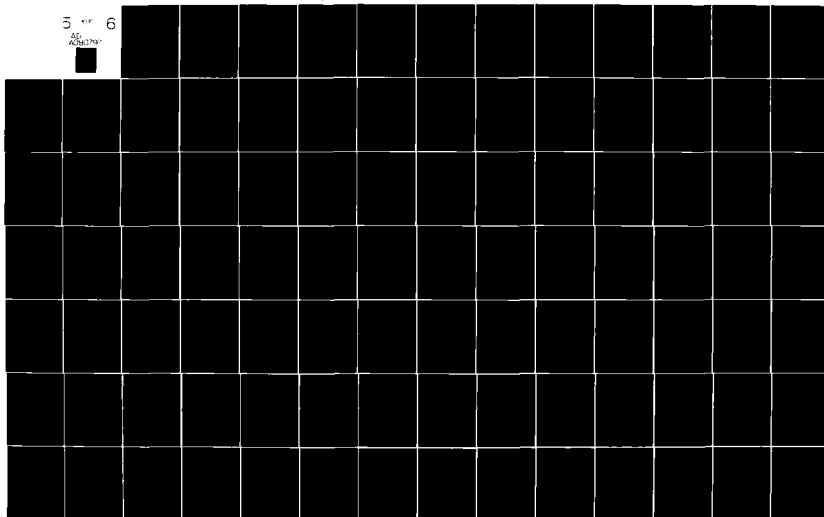
COASTAL ENGINEERING RESEARCH CENTER FORT BELVOIR VA  
AN ANNOTATED BIBLIOGRAPHY OF PATENTS RELATED TO COASTAL ENGINE--ETC(U)  
NOV 79 R E RAY, M D DICKEY, A M LYLES  
CERC-MR-79-6-VOL-3-APP

F/0 13/8

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5 of 6



3,991,576

# FLOATING BREAKWATER

Sandanori Tazaki, Kodairo, and Yozo Ishida, Kunitachi, both of Japan, assignors to Bridgestone Tire Company Limited, Tokyo, Japan

Division of Ser. No. 398,368, Sept. 18, 1973. This application Dec. 27, 1974, Ser. No. 536,783

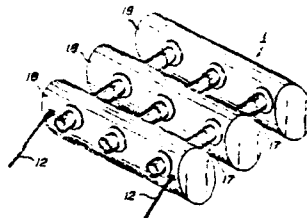
Claims priority, application Japan, Sept. 19, 1972, 47-107980; Sept. 30, 1972, 47-113640; May 9, 1973, 48-54312 Int. Cl.<sup>2</sup> E02B 3/06

U.S. Cl. 61-5

1 Claim

A floating breakwater in which the floating body is formed by housing a floating material as a floating source and a weighting material as a source for increasing weight in a hollow shell composed of a rigid material and provided with a projection on the upper portion. The specific gravity of the floating body is made to be 0.15 - 0.75 owing to the floating material and the weighting material.

Keywords: Breakwater, floating



3,991,581

# METHOD AND APPARATUS FOR HANDLING PILING AND ANCHORING AN OFFSHORE TOWER

Alfred Reeves Kolb, Corleston on Sea, England, assignor to Brown & Root, Inc., Houston, Tex.

Filed June 2, 1975, Ser. No. 582,677

Int. Cl.<sup>2</sup> E02B 17/00

U.S. Cl. 61-53.5

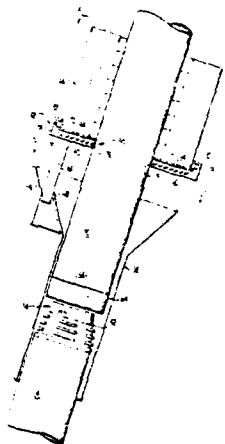
10 Claims

A method and apparatus for handling piling and anchoring an offshore tower are disclosed wherein sudden loading of a derrick handling the piling is avoided as the piling is moved into position preparatory to driving. The apparatus entails a base intended to rest upon an upper end of a piling guide. A releasable gripping means is connected to the base and serves to grip and restrain an add-on piling while the add-on piling is connected to a piling connected and thus suspended within the piling guide and also while the suspended piling is released therefrom. Releasing means are employed to release the gripping means to permit concurrent downward movement of the add-on and suspended piling.

In further aspects, the apparatus and method of the invention effect the connection of an add-on piling to a piling suspended from an offshore tower by first at least partially enclosing the add-on piling within a chuck releasably gripping the add-on piling. The add-on and chuck are next hung from the boom of a floating derrick and the add-on piling is connected to the suspended piling. The piling is thereafter disconnected from the piling guide while the suspension thereof is concurrently maintained by a restraining engagement between the chuck and the piling guide. Ultimately the piling is lowered and forced into the strata underlying the floor of the body of water.

Keywords: Offshore platform, fixed; Offshore platform, leg; Pile placement; Pile section connection

U.S. Cl. X.R. 61-86



3,991,582

# ROTATING-BUMPER FENDER SYSTEM

Tom C. Waldrop, and Clarence T. Thomerson, both of Arlington, Tex., assignors to Regal Tool & Rubber Co. Inc., Arlington, Tex.

Filed Sept. 24, 1974, Ser. No. 508,776

Int. Cl.<sup>2</sup> E02B 3/22; B63B 21/04; F16F 7/12

U.S. Cl. 61—48

7 Claims

Keywords: Collision protection; Offshore structure fender

U.S. Cl. X.R. 114-220; 267-140

A fender system including a supporting frame mounted on a stationary structure by energy-absorbing shock mounting members, and the frame carrying annular bumper members stacked one above the other and sized for rotation about a pipe column, the bumper members each having their respective end surfaces stepped at an annular step in such a way that the stepped surfaces of adjacent bumpers mate and interlock, and the bumper members having multiple relief holes extending in from their end surfaces parallel to the axis of the bumper members and tending to impart a degree of asymmetrical distortion to an impacted bumper member causing it to creep around the pipe column on which it is supported; such rotation being aided by friction reducing means on the surfaces of the bumper members.



3,991,623

# MARINE INSTRUMENT

Lawrence C. Murdock, Bellevue, Wash., assignor to Westinghouse Electric Corporation, Pittsburgh, Pa.

Filed Oct. 9, 1973, Ser. No. 404,565

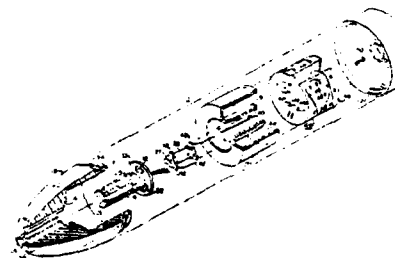
Int. Cl.<sup>2</sup> G01W 1/00

U.S. Cl. 73—170 A

10 Claims

Keywords: Instrument deployment; Salinity measurement

An expendable instrument for determining salinity versus depth in a water column and suitable for use from vessels underway, from helicopters, and from fixed platforms. The salinity indication is obtained by the use of a conductivity cell for measuring the water conductivity, and a standard cell for measuring the conductivity of a standard sample, and obtaining the conductivity ratio. The resultant is transmitted up a wire link to processing equipment.



3,991,695

# WATERCRAFT DOCKING

Frank W. McDonald, 4420 Choctaw Circle SE., Huntsville, Ala. 35801

Filed Jan. 8, 1976, Ser. No. 647,589

Int. Cl.<sup>2</sup> B63C 1/02, 1/06

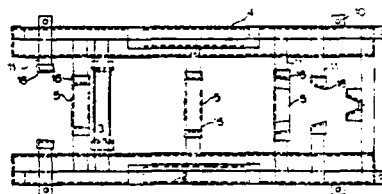
U.S. Cl. 114-45

3 Claims

The invention described and disclosed herein is a dry dock for boats which consists of a frame, formed supports for the boat hull, guides used in docking and lateral support for the docked boat, air bladders to provide flotation, air control valves with an air-line system, and guides to restrain the dry dock to a stall in a marina. The dry dock provides a dry stowage of the boat, which is free from ice damage during the winter season and a means of effecting hull and propeller maintenance without beaching the vehicle or using heavy-duty facilities.

Keywords: Small-craft launcher; Small-craft service structure

U.S. Cl. X.R. 61-65



3,992,105

# METHOD AND APPARATUS FOR REMOTE SALINITY SENSING

Peter G. White, Rancho Palos Verdes, Calif., assignor to TRW Inc., Redondo Beach, Calif.

Filed Mar. 10, 1975, Ser. No. 557,199

Int. Cl.<sup>2</sup> G01J 4/04

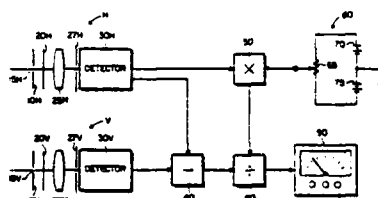
U.S. Cl. 356-118

8 Claims

Disclosed is an improved method and apparatus for remote sensing of the salinity of large bodies of water. Intensity values are simultaneously obtained for the horizontally and vertically polarized components of sunlight specularly reflected as a solar glitter pattern at a point on the surface of the body of water where the salinity is known. The aperture of the vertical polarization detection optical system is adjusted so that the signal voltage from that system is equal to that generated from the horizontal polarization detection optical system at that point. A signal whose amplitude corresponds to the change in salinity between another point and that known point on the surface is generated by multiplying the signal from the horizontal polarization detector by a function of the solar zenith angle and dividing the difference between the output from the horizontal polarization detector and a vertical polarization detector by this product.

Keywords: Instrument, airborne; Salinity measurement

U.S. Cl. X.R. 356-114; 356-209



3,992,272  
**SUBMERGED OFFSHORE PLATFORM JOINT  
 PROTECTION**

Orwin G. Maxson, and Marvin L. Peterson, both of Ponca City,  
 Okla., assignors to Continental Oil Company, Ponca  
 City, Okla.

Filed May 29, 1975, Ser. No. 582,416  
 Int. Cl.<sup>2</sup> C23F 13/00; E02D 5/22

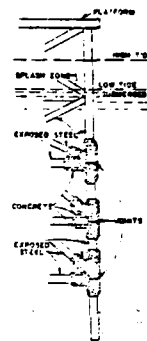
U.S. Cl. 204-147

7 Claims

Submerged offshore steel platform joints are coated with concrete with the steel members between concrete-covered joints protected cathodically to prevent corrosion and corrosion fatigue. The combination allows more economical cathodic protection and extends the useful life of the submerged joints of the offshore structure.

Keywords: Cathodic protection; Coating;  
 Corrosion prevention; Offshore  
 platform, leg

U.S. Cl. X.R. 61-54; 204-148; 204-196;  
 204-197



3,992,292  
**MOVING BELT-TYPE OIL SKIMMER WITH  
 PROPULSION INDUCED FLOW, METHOD AND  
 APPARATUS**

Eldon L. Grimes, and David W. Lerch, both of Seattle, Wash.,  
 assignors to Marine Construction & Design Co., Seattle,  
 Wash.

Filed Oct. 15, 1974, Ser. No. 514,814  
 Int. Cl.<sup>2</sup> B01D 15/06; E02B 15/04

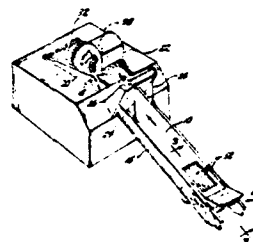
U.S. Cl. 210-30 A

9 Claims

An oil spill recovery method and apparatus utilizing a low-resistance flow-through endless belt of reticular oleophilic, hydrophobic material and forced flow of water with oil through the belt through induction effected by propulsion means operating at a position immediately behind and beneath the submerged active portion of the belt.

Keywords: Pollutant, mechanical removal;  
 Pollutant removal watercraft

U.S. Cl. X.R. 210-242AS; 210-DIG.26



NOVEMBER 23, 1976

3,992,735

**FLOTATION RING FOR DREDGE PIPE LINES**

Edward P. McCarthy, 360 SW. 18th Terrace, Miami, Fla. 33129

Continuation-in-part of Ser. No. 519,311, Nov. 1, 1974, abandoned. This application Sept. 11, 1975, Ser. No. 612,361  
Int. Cl.<sup>2</sup> B63B 21/52

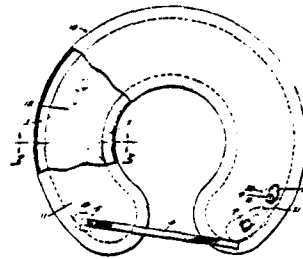
U.S. Cl. 9-8 R

5 Claims

A hollow, flexible, two-sided, substantially C-shaped open ring which, when deflated, can readily be distorted for easy application in surrounding relation with respect to a length of dredge pipe, including strap means for temporarily securing the ring in place, and which when subsequently inflated, assumes a substantially circular cross-sectional shape and constricts radially to securely embrace the peripheral wall of the pipe for use in the flotation thereof.

Keywords: Dredge pipe

U.S. Cl. X.R. 9-340; 9-345



3,992,737

**SUSPENSION SYSTEM FOR UNDERWATER EQUIPMENT**

Don Myrton Duell, Phoenix, Ariz., and Helmut Carl Maierhofer, Valencia, Calif., assignors to Motorola, Inc., Chicago, Ill.

Filed Dec. 11, 1975, Ser. No. 639,738  
Int. Cl.<sup>2</sup> B63B 21/52

U.S. Cl. 9-8 R

19 Claims

A system for suspending underwater equipment at a predetermined depth below the surface; the system providing storage means for the equipment prior to deployment, protection for the equipment during deployment and stabilization of the equipment at a predetermined depth below the water surface after deployment. A subsystem of virtual masses and a vertically oriented "window shade" drogue is deployed to provide stabilization of the equipment in both vertical and horizontal directions after deployment. Portions of the deployment package are subsequently utilized as part of the stabilization subsystem.

Keywords: Buoy, instrumented; Instrument deployment

U.S. Cl. X.R. 340-2



3,992,881  
**APPARATUS TO GENERATE HIGH PRESSURE AIR  
 FROM WATER**

William A. Scherrer, 6700 Alvina St., Bell Gardens, Calif.  
 90207

Filed Aug. 25, 1973, Ser. No. 607,685

Int. Cl.<sup>2</sup> F15B 11/06, 21/00

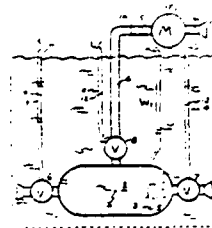
U.S. Cl. 60-398

15 Claims

A water holding tank is placed at a substantial water depth. Two water valves and an air valve are on the tank. A conduit leads from the tank to the surface atmosphere. A second embodiment of the invention includes a hollow cannister member placed at a substantial water depth and has a filter with walls of material permeable to dissolved air but not liquid water. A conduit leads from the cannister member to the surface atmosphere. There is a regulating valve in the conduit. Gas pressure driven prime movers, cooling condensers or air liquifier nozzle extensions connect to the said conduits.

Keywords: Power, submerged source

U.S. Cl. X.R. 60-530; 60-531; 60-670



3,993,913  
**TIDEWATER POWER SYSTEM**  
 Smith V. Dickman, 1807 27th St., West, Bradenton, Fla.  
 33505

Filed Mar. 28, 1975, Ser. No. 562,840

Int. Cl.<sup>2</sup> F03B 13/10

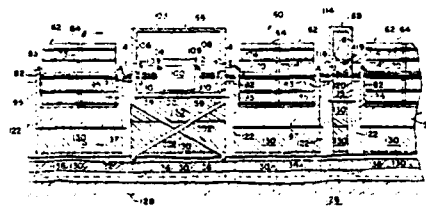
U.S. Cl. 290-53

23 Claims

A system for extracting power from the tides includes a dam constructed in a body of water subject to tidal flow for separating the body of water from a tidal basin between the dam and the shoreline. A plurality of water wheel assemblies are mounted on the dam and include mounting saddles for mounting water wheels for rotation about a horizontal axis at a level about the high tide level of the body of water and with the bottom of the water wheel at substantially the low tide level of the body of water. Each saddle includes a pair of vertical wall members, between which the water wheel is mounted for rotation, and a horizontal wall portion below the water wheel provided with a concave recess receiving the water wheel. The saddle is so constructed that substantially all of the water flowing from the body of water to the tidal reservoir and vice versa will flow through the water wheels. In order to control this flow, a brake is provided to block rotation of the water wheels at the discretion of an operator. The dam is constructed from a plurality of spaced vertical I-beams and a plurality of horizontal slabs which extend between successive I-beams. A saddle extension mounts the saddle on the dam by fitting vertical arm members between the flanges of successive I-beams. The water wheel includes a plurality

Keywords: Channel barrier; Electrical generator; Power, tide; Tidal estuary water level

of radially extending paddles and may have its ends closed by end walls; vent apertures are provided, either in the paddles adjacent the shaft or in the end walls adjacent the shaft. In one embodiment, a gate is provided and is moved in response to the speed of rotation of the water wheel to maintain the speed of rotation substantially constant.



NOVEMBER 30, 1976

3,994,082

**AIR OPERATED DREDGING APPARATUS**

Giovanni Faldi, Florence, Italy, assignor to Pneuma International S.A., Luxembourg

Filed Dec. 5, 1974, Ser. No. 530,004

Claims priority, application Italy, Jan. 4, 1974, 19113/74  
Int. Cl.<sup>2</sup> E02F 3/88

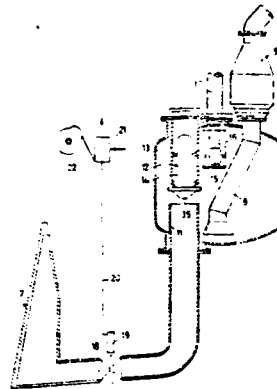
U.S. Cl. 37-71

4 Claims

Air operated dredging apparatus comprising a submerged pumping unit adapted to be dragged along an underwater bed which unit includes at least two pumping chambers periodically filled with loose material in admixture with water entering the chamber through a duct connecting a dredging shovel to the chamber, and emptied by feeding compressed air into the said chamber. A check valve is provided on the duct upstream of the entrance to the chamber whereby escape of air through the duct and the shovel is avoided.

Keywords: Dredge, suction; Dredge intake; Pump

U.S. Cl. X.R. 417-122; 417-137



3,994,134

**APPARATUS FOR POWER GENERATION IN DEEP SEAWATER**

Steven I. Molnar, Flushing, N.Y., assignor to Cooper Union Research Foundation, Inc., New York, N.Y.

Continuation-in-part of Ser. No. 462,119, April 18, 1974, abandoned. This application July 10, 1975, Ser. No. 594,811  
Int. Cl.<sup>2</sup> F03B 13/10, 15/04

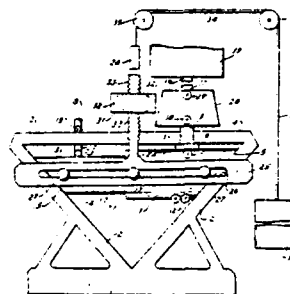
U.S. Cl. 60-496

7 Claims

The apparatus is operating in deep seawater, creating there a space of normal pressure and utilizing the arising pressure difference. The device consists of a telescope-like moving pumping equipment, furthermore an angularly built border frame, a prime mover, a locomotion equipment with motor, a counterbalancing system and a power generator.

Keywords: Electrical generator; Power, submerged source

U.S. Cl. X.R. 290-53





3,994,629  
**MECHANISM FOR TAPPING THE SURF ENERGY**  
 Lin Tah-sun, 3rd Fl., 146 Chang Chun Road, Taipei, China  
 Taiwan  
 Filed Nov. 18, 1974, Ser. No. 524,714  
 Int. Cl.<sup>2</sup> F03B 15/14, F04B 17/00  
 U.S. Cl. 417-329 4 Claims

A mechanism utilizing the energy of the surf including a gravitational bucket with a rack on the outside thereof. The rack engages a gear which drives a reciprocating water pump. The pump transports water to a tank for use later as a source of steady controllable energy.

Keywords: Power, wave; Pump

U.S. Cl. X.R. 60-640; 417-330



3,994,795  
**SACRIFICIAL ANODE**  
 George W. Kurr, Fair Lawn, N.J., assignor to Federated Metals Corporation, New York, N.Y.  
 Continuation-in-part of Ser. No. 384,186, July 31, 1973, abandoned, which is a continuation-in-part of Ser. No. 283,617, Sept. 13, 1972, abandoned. This application Mar. 24, 1975, Ser. No. 561,127  
 Int. Cl.<sup>2</sup> C23F 13/00  
 U.S. Cl. 204-197 13 Claims

Fracturing of arcuate anode segments per se or of an anode section of a sacrificial anode during installation of bracelet-type anodes about a pipeline to be cathodically protected is minimized. Distortion of the anode segment during cooling of the metal after casting the segment is also minimized. The minimizing of the distortion and fracturing of the anode segments is attained in certain embodiments of the invention, for a given pipeline of a certain diameter, by the arcuate-shaped anode segments each being of an arc length which is not above a predetermined maximum arc length in the range of about 14 inches to about 27 inches. The sacrificial anode assembly comprises an even-numbered plurality in the range of 4 to 8 of the arcuate-shaped anode segments secured about the pipeline in pipe-embracing relationship thereto, such plurality of anode segments being 4 anode segments for a pipeline of pipe diameter in the range of about 20 inches to about 36 inches, 6 anode segments for a pipeline of pipe diameter in the range of about 30 inches to about 54 inches, 8 anode segments for a pipeline of pipe diameter in the range of about 40 inches to about 72 inches, 4 or 6 anode segments for

Keywords: Cathodic protection; Corrosion prevention

U.S. Cl. X.R. 204-280

a pipeline of pipe diameter in the range of about 30 inches to about 36 inches, and 6 or 8 anode segments for a pipeline of pipe diameter in the range of about 40 inches to about 54 inches. The maximum arc length of each anode segment is determined prior to its casting and installation on the pipeline by the formula:

$$\text{Maximum arc length of anode segment} = \frac{\pi D}{n} - 2 \text{ inches}$$

wherein D is the diameter of the pipeline in inches and n is the total number of anode segments in the assembly.



3,995,160

**METHOD AND APPARATUS FOR OBTAINING  
ELECTRICAL POWER FROM SEA WATER**

Clarence Zener, Ligonier, and John G. Fetkovich, O'Hara Township, both of Pa., assignors to Carnegie-Mellon University, Pittsburgh, Pa.

Filed May 6, 1975, Ser. No. 575,089

Int. Cl.<sup>2</sup> F02G 1/00

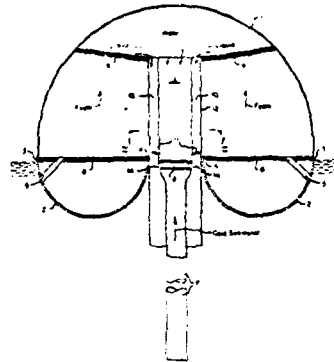
U.S. Cl. 290-1 R

10 Claims

A method and apparatus for producing electricity utilizing a foam formed from ocean water at ambient temperatures. The method and apparatus utilize the enthalpy released by a rising foam to generate the power to drive a turbine for power export.

**Keywords:** Electrical generator; Offshore platform, floating; Power, submerged source

U.S. Cl. X.R. 60-641



DECEMBER 7, 1976

3,995,434

**WAVE DISSIPATING WALL**

Hisanori Kato, Tochigi, and Hiroshi Okamoto, Kamiinayo, both of Japan, assignors to Nippon Tetrapod Co., Ltd., Tokyo, Japan and Robert Q. Palmer, Las Vegas, Nev.

Filed July 29, 1975, Ser. No. 600,008

Claims priority, application Japan, Aug. 8, 1974, 49-90300

Int. Cl.<sup>2</sup> E02B 3/06

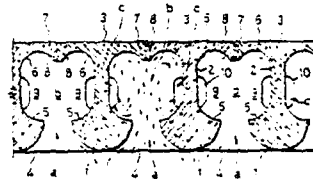
U.S. Cl. 61-4

16 Claims

A wave dissipating wall is formed of a plurality of wave chambers comprising a plurality of horizontal plates and vertical partition walls opening toward the direction from which waves come in. The ends of the walls dividing the chambers are wider than the remaining parts of the walls and the front walls comprise semi-circular curved surfaces extending toward the direction from which the waves come in order to introduce the waves into the chamber having a wider width than the entrance formed between the respective front walls and to let the waves circulate within the chamber by the energy of the waves, thereby increasing the friction resistance between the waves and the walls as much as possible and achieving an efficient diminishing of the wave energy.

**Keywords:** Bulkhead; Concrete block; Seawall

U.S. Cl. X.R. 52-607; 52-611



3,995,437

**SHOCK ABSORBING ARRANGEMENT FOR A MARINE STRUCTURE**

Glen E. Drewett, P.O. Box 52627, Lafayette, La. 70501

Filed June 9, 1975, Ser. No. 585,427

Int. Cl.<sup>2</sup> E02B 3/20; B60R 15/03

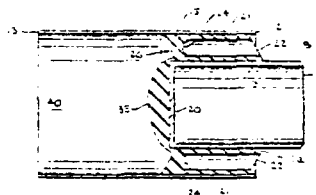
U.S. Cl. 61-86

4 Claims

A shock absorbing arrangement for marine structures includes an annular elongated hollow body with an elastomer body molded adjacent one end of the annular body, the elastomer body having a plurality of circumferentially spaced voids therein extending from one end of the body and terminating in spaced relation relative to the other end of the body. A cylinder is molded in the center of the body and has an open end facing in the same direction as the open end of the voids and a closed end adjacent but spaced from the other end of the elastomer body and the elastomer body is provided with an enlargement adjacent the closed cylinder end to serve as a shock absorber and bumper.

**Keywords:** Collision protection; Offshore structure fender; Pier fender; Pile protection

U.S. Cl. X.R. 61-48; 114-219; 267-140



3,995,438

**METHOD FOR INCREASING THE LOAD CARRYING CAPACITY AND PULL-OUT RESISTANCE OF HOLLOW PILES**

Ivo C. Pogonowski, Houston, Tex., assignor to Texaco Inc., New York, N.Y.

Division of Ser. No. 401,778, Sept. 28, 1973, Pat. No.

3,874,181, which is a division of Ser. No. 247,584, April 26, 1972, Pat. No. 3,795,035. This application Nov. 4, 1974, Ser. No. 520,709

Int. Cl.<sup>2</sup> E02D 5/44

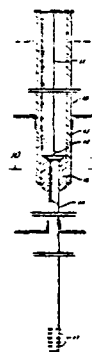
U.S. Cl. 61-53.68

1 Claim

A plurality (preferably six) pistons and cylinders are suspended from the swage block a precise distance below the upper edge and actuatable radially from the longitudinal axis of a tubular member for making a new pile with anchor knobs for increased load carrying capacity and pull-out resistance.

**Keywords:** Embedment anchor; Pile, concrete; Pile, sheet

U.S. Cl. X.R. 61-98; 61-53



3,995,439

**DEVICE FOR EMBEDDING OBJECTS SUCH AS  
CONTINUOUS PIPES INTO WATER BOTTOMS**

Udo Hahlbrock, Hannover, Germany, assignor to O & K Oren-  
stein & Koppel Aktiengesellschaft, Germany

Filed Mar. 3, 1975, Ser. No. 554,662

Claims priority, application Germany, Mar. 8, 1974,  
2411140

Int. Cl.<sup>2</sup> E02F 5/06

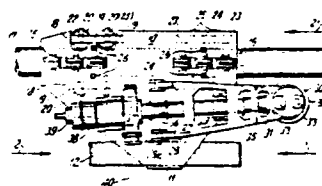
U.S. Cl. 61-72.4

15 Claims

A device for embedding objects such as continuous pipes into water bottoms comprises a support frame which is movable along the bottom on a drive track which is carried adjacent one side thereof. The support frame also carries a plurality of guide and drive rollers which are engageable with the object to be embedded and which engage the object to move the support frame along the object as the drive track advances along the water bottom. A bottom trenching device in the form of a ground mill with a rotatable cutting head is pivotally mounted on a support between the drive rollers and the drive track and it operates on the bottom to remove material therefrom to form a trench. The material may be subsequently directed backwardly over the object to be embedded after it is positioned in the trench.

**Keywords:** Seabed pipeline placement; Seabed  
trencher

U.S. Cl. X.R. 37-65



3,995,480

**THERMAL SENSOR FOR MEASUREMENT OF OCEAN  
CURRENT DIRECTION**

Gene A. Edgerton, Ventura, Calif., assignor to The United  
States of America as represented by the Secretary of the  
Navy, Washington, D.C.

Filed Aug. 8, 1975, Ser. No. 603,219

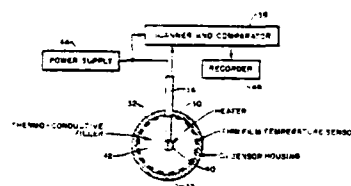
Int. Cl.<sup>2</sup> G01P 13/00; G01W 1/00

U.S. Cl. 73-188

9 Claims

A spherical sensor having the inside thereof lined with a plurality of temperature sensing elements, multiplexing circuitry for sequentially measuring the temperature of said sensors, and a comparison circuit for determining the sensors of greater temperature to thereby derive the direction of fluid flow.

**Keywords:** Current measurement



3,996,134

METHOD OF DISPERSING OIL IN WATER

Peter George Osborn, Bourne End; Peter Francis Nicks, Maidenhead, and Michael George Norton, Burnham-on-Crouch, all of England, assignors to Imperial Chemical Industries Limited, London, England

Filed Dec. 13, 1974, Ser. No. 532,092

Claims priority, application United Kingdom, Jan. 17, 1974, 2192,74; Apr. 24, 1974, 17883,74

Int. Cl.<sup>2</sup> C02B 9/02

U.S. Cl. 210-59

13 Claims

A method of dispersing oil in water, particularly useful in oil slick dispersion, secondary oil recovery and tar-sand oil recovery comprises contacting the oil and water with an alkyl resin in which one component of the resin is the residue of a water-soluble polyalkylene glycol such as a polyethylene glycol.

Keywords: Pollutant dispersion

U.S. Cl. X.R. 252-351; 210-DIG.27

No Figure

3,996,138

MARINE LIFE PROTECTOR

Ernest Daidola, and John C. Daidola, both of 39 Kilburn Ave., Huntington Station, N.Y. 11746

Filed Aug. 2, 1974, Ser. No. 494,125

Int. Cl.<sup>2</sup> E02B 15/04

U.S. Cl. 210-170

14 Claims

A device for protecting marine life from water intake ducts is presented. The intake duct enters the marine life protector which is characterized as an inner body of water separated from the main outer body of water by means of barrier walls. Through one or more of these barrier walls, input ducts are arranged which pass through the barrier walls having their longitudinal axes other than parallel to the free surface of the water bodies so that the input and exit orifices of the ducts are at different water levels. At least one of these orifices may be covered with a grating or screening or other additional protective means.

Keywords: Seabed water, process structure

U.S. Cl. X.R. 61-21



DECEMBER 14, 1976

3,996,678  
FREE-FALL GRAB

Hans M. Amann, Hannover, and Fritz Otto Poeppel, Luthé,  
both of Germany, assignors to Preussag Aktiengesellschaft,  
Germany

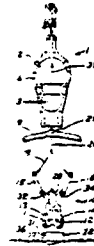
Filed Sept. 11, 1975, Ser. No. 612,234  
Claims priority, application Germany, Sept. 16, 1974,  
2444167

Int. Cl.<sup>2</sup> B66C 3/02  
U.S. Cl. 37-183 R 10 Claims

Keywords: Instrument retrieval; Sampler,  
seabed grab

U.S. Cl. X.R. 37-184; 212-84; 214-656;  
294-70

A scissors-type, free-fall grab is disclosed for picking up ground samples from a sea bed. The grab includes two grab halves which may pivot relative to one another. A transverse bar engages the upper ends of the grab halves to hold the grab in its opened position. This transverse bar is attached by a cable arrangement to a buoyancy member. Upward movement of the buoyancy member causes the transverse bar to become disengaged from the upper ends of the grab halves and forces the grab halves to move to their closed position. The grab carries weights which fall off of the grab as the grab moves from its opened to its closed position.



3,996,754  
MOBILE MARINE DRILLING UNIT

Edwin L. Lowery, Houston, Tex., assignor to Engineering  
Technology Analysts, Inc., Houston, Tex.

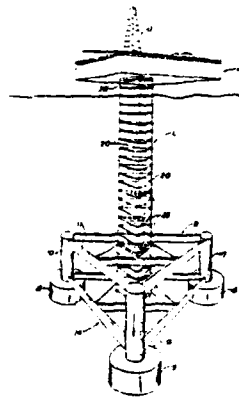
Filed Dec. 14, 1973, Ser. No. 424,838  
Int. Cl.<sup>2</sup> E02B 17/00

U.S. Cl. 61-92 5 Claims

Keywords: Offshore platform, jack up;  
Offshore storage tank, submerged;  
Seabed foundation

U.S. Cl. X.R. 61-101; 175-7

A mobile marine drilling unit comprising: a floatable base; a floatable platform; and a vertical support leg attached to said base and extending upwardly through a well provided therefor in said platform. Said base and a major portion of said leg being submergible in a body of water for support on the floor thereof. The support leg and platform are provided with elevating mechanisms for elevating the platform above said body of water on said leg. In deploying the drilling unit, the unit is floated to a selected site with the base drawn up underneath the platform and the leg extending upwardly through the well. When the site is reached the base is submerged with ballast until it is supported on the water body floor. Then the platform is elevated above the water body by the elevating mechanisms. A derrick may be moved over the leg well and drilling in the water body floor conducted through the well and leg.



3,996,756

**METHOD AND APPARATUS FOR SUPPORTING A  
DRILLING PLATFORM ON THE OCEAN FLOOR**

Joseph F. Schirtzinger, Pasadena, Calif., assignor to Sea-Log Corporation, Pasadena, Calif.

Filed Apr. 8, 1974, Ser. No. 458,986

Int. Cl.<sup>2</sup> E02B 17/00; E21B 7/12

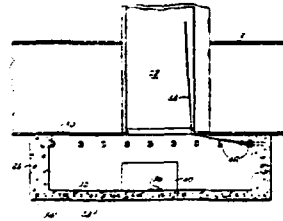
U.S. Cl. 61-88

3 Claims

A method and apparatus for positioning and supporting a drilling platform on the ocean floor in which the drilling platform is a monopod structure with a broad flat base. The ocean floor is dredged to form a large level area depressed below the mudline. A precast drilling cellar having a flat bottom wall and upstanding side walls extending around the perimeter of the bottom wall is lowered to the leveled area. Hydraulic jets in the bottom of the cellar displace material from beneath the cellar, allowing the cellar to sink into the ocean floor to the depth of the sidewalls. The platform is centered over the cellar with the base resting on the top of the sidewalls.

Keywords: Offshore construction; Offshore platform anchor; Seabed foundation

U.S. Cl. X.R. 61-50; 166-.5; 175-9



3,996,757

**APPARATUS FOR PROTECTING METALLIC  
STRUCTURAL ELEMENTS AGAINST CORROSION**

Orval E. Liddell, P.O. Box 1533, Avalon, Calif. 90704

Continuation of Ser. No. 310,831, Nov. 30, 1972, abandoned.

Continuation of Ser. No. 103,432, Jan. 4, 1971, abandoned.

This application July 22, 1974, Ser. No. 490,316

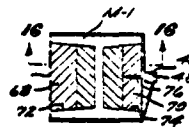
Int. Cl.<sup>2</sup> E02D 5/60

U.S. Cl. 61-54

4 Claims

Apparatus for protecting a partially or fully submerged metallic structural element against corrosion from water, air or a combination of both. A pliable watertight and airtight encasement is wrapped around the portion of the element to be protected. Seal means are utilized to seal the edges of the encasement against water and air. If the encasement is of an irregular shape, fillers are secured to the structural element, such fillers having a circular configuration, and the encasement is wrapped around the fillers.

Keywords: Coating; Corrosion prevention; Pile protection; Pile, steel



3,996,794

**DIFFERENTIAL DEPTH INDICATOR**

Robert E. Helgans, Jr., Chester, N.J., assignor to The United States of America as represented by the Secretary of the Navy, Washington, D.C.

Filed Oct. 17, 1966, Ser. No. 588,270

Int. Cl.<sup>2</sup> G01D 3/00

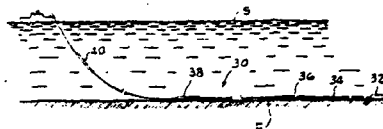
U.S. Cl. 73-170 A

5 Claims

A differential depth indicator for measuring the attitude of an underwater cable which is being laid. Pressure transmitting points are spaced in an array which attached to the cable being laid, and the pressure at each point is transmitted via fluid conduits to differential pressure transducers. The transducers give an electrical indication of the differential pressure which is sent to the surface where it may be visually displayed.

**Keywords:** Depth pressure measurement; Instrument deployment; Seabed pipeline placement; Seabed site survey

U.S. Cl. X.R. 73-301



3,996,876

**MARINE LINE SECURING APPARATUS**

Lawrence L. Sinclair, 123 Old Carriage Road, Ponce Inlet, Fla. 32019

Filed Nov. 10, 1975, Ser. No. 630,315

Int. Cl.<sup>2</sup> B63B 21/04

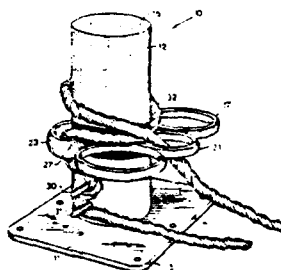
U.S. Cl. 114-218

11 Claims

A line securing apparatus for attaching the line of a marine vessel to a dock, pier, or the like, has a base adapted with a post attached thereto. A plurality of rings is attached to the post and to each other whereby a boat line may be slipped through the rings and over the post to hold the line to the dock. A wedging member is also attached to the post for wedging a vessel line therein; and protruding rods give additional support to a line held in the wedging member.

**Keywords:** Small-craft mooring device

U.S. Cl. X.R. 24-115J





3,997,022  
**DEVICE FOR GENERATING ACOUSTIC WAVES BY  
 IMPLOSION**

Jacques Cholet, Rueil Malmaison, France, assignor to Institut  
 Francais du Petrole, des Carburants et Lubrifiants et Entre-  
 prise de Recherches et d'Activites Petrolieres Elf, France  
 Filed May 16, 1975, Ser. No. 578,183  
 Claims priority, application France, May 20, 1974,  
 74.17775

Int. Cl.<sup>2</sup> G01V 1/02

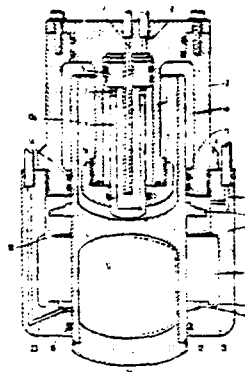
U.S. Cl. 181-129

17 Claims

Device for generating acoustic waves in a fluid medium by implosion, comprising a main cylinder, a main piston slidably mounted therein, said piston having a hollow cylindrical portion housing another cylinder solid with the main one and, through the bottom of which passes the hollow rod of another piston, actuated by hydraulic means and which drives in translation the main piston. By means of an annular valve, solid with the main piston, and further hydraulic means, the main piston may be locked in a position of spaced relationship with respect to the main cylinder and abruptly unlocked, thereby generating an implosion.

Keywords: Seismic implosive acoustic transmitter

U.S. Cl. X.R. 181-119; 181-402



DECEMBER 21, 1976

3,998,060  
**BARRIER FOR WATER CARRIED POLLUTANTS**  
 Paul Freus, Smith Road, Toms River, N.J. 08753  
 Filed Apr. 14, 1976, Ser. No. 676,794  
 Int. Cl.<sup>2</sup> E02B 15/04; B63B 35/00

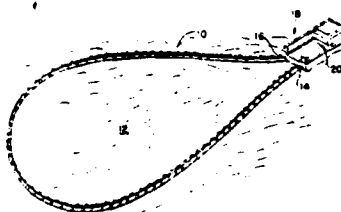
U.S. Cl. 61-1 F

6 Claims

A barrier for water carried pollutants comprises a series of end to end connectable boom sections containing a floatable material which may comprise an oleophilic-hydrophobic-lighter than water composition which will selectively absorb hydrocarbons; fluid impervious connectors for the ends of the boom sections and flexible draft members and associated connectors for maintaining the integrity of the boom if it becomes necessary to replace one or more of the boom sections.

Keywords: Pollutant absorption; Pollutant, surface barrier

U.S. Cl. X.R. 210-DIG.25



3,998,061  
FORMATION OF CAVITIES IN THE BED OF A SHEET OF WATER

Christian Jackie Rederon, Neuilly-sur-Seine; Gerard Pierre Souquet, Marly-le-Roi, and Paul Louis Poulallion, Villepreux, all of France, assignors to C. G. Doris (Compagnie Generale pour les Developement Operationnels des Richesses Sous-marines), Paris and Societe Francaise de Stockage Geologique GEGSTOCK, Courbevoie, both of, France

Filed Mar. 24, 1975, Ser. No. 561,660

Claims priority: application France, Apr. 4, 1974, 74.12044  
Int. Cl.<sup>2</sup> E02D 21/00

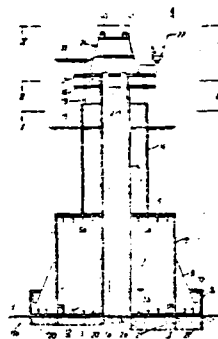
U.S. Cl. 61-88

10 Claims

In order to form galleries or other subterranean cavities in the bed of a sheet of water, for example for the construction of a subterranean reservoir for storing petroleum, or for exploiting submarine deposits, a floating structure, comprising at least one and preferably two hollow shafts, is ballasted so that it rests upon the seabed or underwater surface, a bore is excavated in extension of each hollow shaft, down to the desired depth, a casing tube is inserted there, extending to above the sheet of water, and one of said casings is used as an access means for the excavation of the galleries or cavities, whilst the other if used to remove the spoil.

Keywords: Offshore construction; Offshore platform, fixed; Offshore storage tank, submerged; Seabed foundation

U.S. Cl. X.R. 61-0.5; 61-50; 61-81



3,998,062  
SEA FLOOR SUPPORTED STRUCTURES WITH CRUSHABLE SUPPORT

Kenneth Wilson Lange, Burr Ridge, Ill., assignor to Chicago Bridge & Iron Company, Oak Brook, Ill.

Filed June 23, 1975, Ser. No. 589,716

Int. Cl.<sup>2</sup> E02D 5/00; E02B 17/02

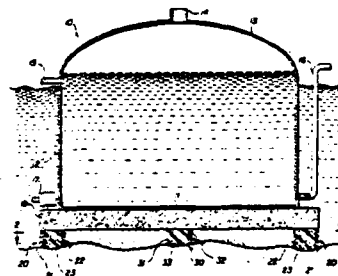
U.S. Cl. 61-50

5 Claims

The improvement in an offshore structure having a rigid base adapted to rest on a sea floor comprising a crushable supporting means mounted beneath the base and projecting downwardly therefrom, and adapted to be partially crushably compressed between the base and the sea floor when the structure is submerged to rest on the sea floor, thereby supporting the structure temporarily or permanently.

Keywords: Offshore storage tank, emergent; Seabed foundation

U.S. Cl. X.R. 52-167; 61-98; 61-101; 220-18; 220-69; 248-23; 248-188.3



3,998,063

**METHOD AND APPARATUS FOR REMOVING  
CONSTRUCTION PILES**

Holton G. Harders, 5521 E. Highway 98, Panama City, Fla.  
32401

Filed Feb. 17, 1976, Ser. No. 658,278  
Int. Cl.<sup>2</sup> E02D 5/22

U.S. Cl. 61-53

17 Claims

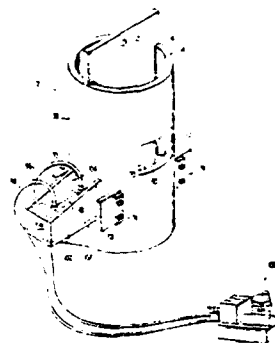
Method and apparatus for removing construction piles in which a clamp mounted in a hollow head grips opposite sides of a pile, and the head is vibrated vertically by means of a vibrating hammer which is clamped to the head so that the head moves up and down as a unit with the hammer to loosen the pile. The vibrating hammer is suspended from a crane cable which, after loosening the pile, is raised to easily remove the pile. In commercial situations where many piles are to be removed from one area, it is preferred that the present invention be used to loosen the piles, leaving complete withdrawal of the piles to a conventional choker operated by a second crane which follows the first crane carrying the vibrating hammer and clamping head of the present invention.

In one embodiment, the clamp head includes a generally hollow steel casing movable over the top of the pile to a point limited by a horizontal plate fixed across a top portion of the casing. A pair of clamping shoes are provided in the casing below the top plate to grip opposite sides of the pile. One of the shoes is movable across

**Keywords:** Pile extractor

U.S. Cl. X.R. 61-53.66

the casing towards and away from a fixed shoe, preferably by a hydraulic jack or fluid motor that may be powered from any suitable source. To guide the movable shoe, a pair of anchor bars are fixed across the casing to slidably receive the movable shoe and maintain it accurately aligned with the fixed shoe as well as to transmit forces from the pile to the steel casing of the clamp head.



3,998,064

**SUBAQUEOUS PILE DRIVING APPARATUS AND  
METHOD**

Joost W. Jansz, The Hague, Netherlands, assignor to Hollandsche Beton Groep N.V., Rijswijk, Netherlands  
Filed June 19, 1975, Ser. No. 588,354

Claims priority, application Netherlands, June 27, 1974,  
7408710; Aug. 14, 1974, 7410905

Int. Cl.<sup>2</sup> E02D 7/00

U.S. Cl. 61-53.5

7 Claims

There is disclosed a system for subaqueous pile driving in which the pile and the hammer are completely submerged. The pile is suspended by at least one cable in such a manner that two cable sections are run in an upward direction from the top of the pile in a parallel manner toward a device located above sea level. The pile is lowered on the cables to the ocean floor, and the pile driving hammer positioned on top of it simultaneously with the pile hammer guided on cable sections. A traverse bore is provided in the pile for passage of the cable, and a temporary support base is provided having slidable frictional contact with the pile for enlarging the base of the pile on the ocean floor.

**Keywords:** Offshore construction; Pile driver, impact; Pile placement

U.S. Cl. X.R. 61-69R; 173-1; 173-112



3,998,733  
**DETERGENT COMPOSITION FOR DISPERSING OIL SPILLS**

Peter Michael Blanchard, West Molesey, and Dudley Grahame Meeks, Kingston-upon-Thames, both of England, assignors to The British Petroleum Company Limited, London, England

Filed Nov. 13, 1974, Ser. No. 523,515

Claims priority, application United Kingdom, Nov. 21, 1973, 53923/73

Int. Cl.<sup>2</sup> B01F 3/08, 17/02; C11D 1/83

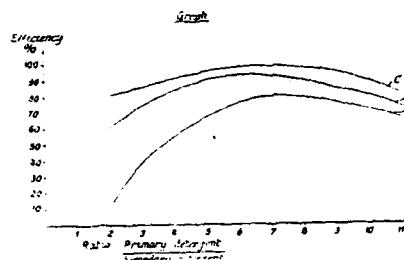
U.S. Cl. 210—59

11 Claims

A detergent composition for dealing with oil spills on water comprises an ester of a polyoxyethylene glycol ester of a C10-24 fatty acid, an organic sulphate or sulphonate detergent, an alcohol or glycol of molecular weight 90-250.

**Keywords:** Pollutant dispersion

U.S. Cl. X.R. 210-DIG.25; 252-170; 252-312; 252-354; 252-550; 252-551; 252-554; 252-559; 252-170



DECEMBER 28, 1976

3,999,312  
**WATER JET TYPE UNDERWATER GROUND EXCAVATOR**

Mitsuo Yamaguchi, and Katsuke Shiroyama, both of Tokyo, Japan, assignors to Furukawa Electric Co., Ltd., Tokyo, Japan

Filed May 8, 1975, Ser. No. 574,593

Claims priority, application Japan, May 8, 1974, 49/51940, Apr. 8, 1975, 50/47453

Int. Cl.<sup>2</sup> E02F 3/88

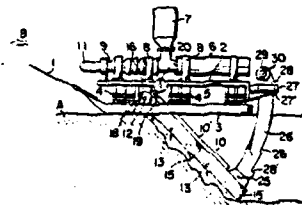
U.S. Cl. 37—62

6 Claims

In a water jet type underwater ground excavator wherein an underwater pump portion is carried on an excavator body including stabilizer sleds, an excavation portion protrudes downwardly and rearwardly under the excavator body, and water is delivered from the underwater pump portion to the excavation portion and then ejected from jet nozzles of the excavation portion so as to excavate the ground under water, an improvement by a sinker arm erected at a free end of the excavation portion in a manner to ascend and descend with upward and downward motions of the free end, whereby the stability of the excavator is enhanced. By joining to the sinker arm a brake equipment which suppresses the ascent thereof, the stability of the excavator is enhanced.

**Keywords:** Seabed trencher

U.S. Cl. X.R. 37-63; 37-78



3,999,313

**TOWED SLED FOR DEEP-SEA PARTICLE HARVEST**

James E. Andrews, Kailua, Hawaii, assignor to Hawaii Marine Research, Inc., Kaneohe, Hawaii

Filed Feb. 10, 1975, Ser. No. 548,301

Int. Cl.<sup>2</sup> E02F 3/14

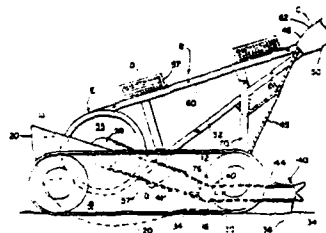
U.S. Cl. 37-69

8 Claims

A method and apparatus for harvesting the ocean floor is disclosed. A sled connected to a vessel is towed over the ocean floor. The sled is supported by spaced apart runners that mount an upwardly open container in which particles to be harvested are collected as the sled is drawn forwardly by the vessel. A cable extends from the vessel to the container and is driven in a forward direction. Buckets are mounted to the cable and have a forwardly directed open end. The cable is guided so that the buckets are moved through the container of the sled to thereby pick up the particles and convey them to the vessel. The sled includes means for dislodging the particles to be harvested from the ocean floor, and for separating from the particles silt and other undesirable contaminants of a size smaller than the particles.

**Keywords:** Dredge intake; Dredge mechanical

U.S. Cl. X.R. 37-DIG.8; 299-8



3,999,395

**SUPPORT ARRANGEMENT FOR A CONSTRUCTION**

Bengt Broms, Vällingby; Ake Lindstrom, Solna, and Ian Larsen, Taby, all of Sweden, assignors to AB Vattenbyggnadsbyran, Stockholm, Sweden

Filed Apr. 22, 1974, Ser. No. 462,783

Claims priority, application Sweden, Apr. 26, 1973, 7305924

Int. Cl.<sup>2</sup> E02D 17/00, 27/38

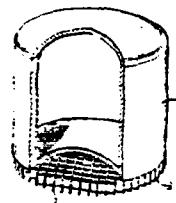
U.S. Cl. 61-99

12 Claims

The invention refers to a foundation or support arrangement to be secured to the lowermost surface of a construction or to one of the lowermost surfaces of a number of legs for supporting a construction intended for marine or submarine installation. According to the invention the foundation or support arrangement comprises a plurality of downwardly directed support elements defining one or more cells or spaces therebetween which are open at the bottom. Said support elements are arranged to penetrate into any deposits present on the bottom of a sea or lake when the construction is positioned on the bottom, said deposits being received in the cells or spaces to a degree dependent on the contour of the bottom.

**Keywords:** Offshore platform, fixed; Offshore storage tank, submerged; Seabed foundation

U.S. Cl. X.R. 61-1R; 61-35; 61-50



3,999,397

MODULAR DOCK SYSTEM

Lewis L. Albery, 14429 Dante, Dolton, Ill. 60419

Filed Jan. 2, 1976, Ser. No. 646,336

Int. Cl.<sup>2</sup> E02B 3/20; E04B 1/00

U.S. Cl. 61—48

10 Claims

A modular dock system comprising one or more dock panels adapted to be interconnected into a pier, each of said panels comprising a plurality of elongated extruded aluminum panel members having a flat upper wall, a pair of side walls having flanges along the lower edges and a central rib structure having lower flanges parallel of the flanges on the side wall, a pair of aluminum cross-members at opposite ends of the panel members have channel shaped cross-section and a web secured to the flanges of said panel members and a pair of downwardly extending side flanges, one of said cross-members spaced inwardly, parallel of the adjacent ends of the panel members and the other of said cross-members having an outside flange spaced outwardly parallel of the opposite adjacent ends of the panel members thereof and a thin sheet of skid resistant plastic material adhesively secured to the upper surface on the upper wall of said panel members.

Keywords: Pier, fixed; Small-craft pier

U.S. Cl. X.R. 52-263; 52-620; 52-629; 108-64



3,999,399

PROTECTIVE GUARD MEANS FOR WOOD PILING AND A METHOD OF INSTALLING SAME UNDER DRY WORKING CONDITIONS

John R. Maurer, Glendora, Calif., assignor to Walter A. Plummer, Sherman Oaks, Calif.

Continuation of Ser. No. 367,816, June 7, 1973, abandoned.

This application Nov. 8, 1974, Ser. No. 521,970

Int. Cl.<sup>2</sup> E02D 5/60

U.S. Cl. 61—54

4 Claims

Protective guard means for wood piling which includes a one-piece waterproof seamed plastic jacket for water-contacted portions of the piling from a level below the lowest water level to a point above high water level. The jacket is gathered snugly about and cinched to the piling and preferably includes a liner immune to attack by wood preservative chemicals. An arcuate guard strip of tough, high impact strength sheet resinous material is clamped to the exterior of the plastic jacket for that portion of the piling likely to be struck, buffeted or abraded by water craft and floating objects. The described protective guard means are assembled to the piling before the piling is driven and preferably above water level and under dry working conditions without need for divers or underwater equipment.

Keywords: Coating; Collision protection; Fouling prevention; Pier fender; Pile protection; Pile, wood

U.S. Cl. X.R. 24-197; 52-623; 61-48



3,999,497

**SHOCK-ABSORBING BUFFER FOR BOARDING FENDER**  
 Denis Hamel, St-Mande, France, assignor to Pneumatiques,  
 Caoutchouc Manufacture et Plastiques Kleber-Colombes,  
 France

Filed June 13, 1975, Ser. No. 586,617

Claims priority, application France, June 13, 1974,  
 74.20515

Int. Cl.<sup>2</sup> F16F 7/12; B63B 59/02

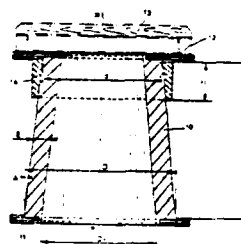
U.S. Cl. 114—219

8 Claims

A shock-absorbing buffer for boarding fenders used for the protection of ships and waterway port structures has a hollow rubber body in the form of a tubular sleeve with a thick wall subjected to compression-bending, and rigid mounting plates affixed to its extremities which are arranged parallel to each other and at right angles to an axis of revolution of the rubber body. The buffer also includes an annular radially extensible rubber element which contacts and encloses at least one of the extremities of the hollow rubber body. This rubber element is separate from the rubber body and is adjacent to the mounting plate at this extremity.

**Keywords:** Pier fender

U.S. Cl. X.R. 61-48; 267-140



3,999,566

**METHOD AND APPARATUS FOR DISCHARGING  
 OVERBOARD EXCESS WATER FROM HOPPER OF  
 HOPPER SUCTION DREDGER OR BARGE OR SCOW**  
 Shigeo Iwata; Ichiro Ofuji, both of Tokyo; Susumu Waseda,  
 Yokohama, and Naoshi Ishimatsu, Funabashi, all of Japan,  
 assignors to Ishikawajima-Harima Jukogyo Kabushiki Kai-  
 sha and Tokushu Shunsetsu Kabushiki Kaisha, both of To-  
 kyo, Japan

Filed Aug. 21, 1975, Ser. No. 606,596

Int. Cl.<sup>2</sup> B65G 53/30

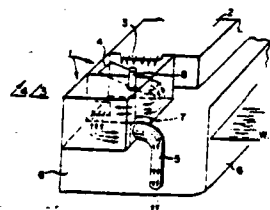
U.S. Cl. 137—1

10 Claims

A method and apparatus for discharging overboard the excess water from the hopper of a hopper suction dredger, barge or scow for removing the air bubbles contained in the discharged water and for preventing the air bubbles from being entrained into the discharged water in order to prevent the turbidity of the water in the dredging area.

**Keywords:** Dredge, suction; Dredge-spoil  
 transport; Hopper barge;  
 Pollutant collection

U.S. Cl. X.R. 37-58; 210-521; 299-9



4. Reissued Patents  
1974 to 1976  
Re. 28,232 to Re. 28,989

Note: Matter enclosed in heavy brackets [] appears in the original patent but forms no part of the reissued specification; matter printed in italics indicates the additions made by reissue.

Re. 28,232

METHODS OF GROUTING OFFSHORE  
STRUCTURES

Max Bassett, Houston, Tex., and Horace W. Olsen, deceased, late of Houston, Tex., by Magdalene M. Olsen, executrix, Houston, Tex., assignors to C. Nelson Shields, Jr., trustee

Original No. 3,601,999, dated Aug. 31, 1971, Ser. No. 858,951, Sept. 18, 1969. Application for reissue July 11, 1973, Ser. No. 378,196

Int. Cl. E02b 17/00; E02d 5/24  
U.S. Cl. 61—46 15 Claims

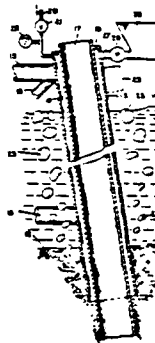
Reissued Nov. 5, 1974

Keywords: Grouting; Offshore construction;  
Pile, structure connection

U.S. Cl. X.R. 61-53.52; 61-53.6; 61-54

*A method for grouting the annulus between the jacket and piling in the legs of an offshore structure in which air is introduced to expel water from the lower end of the annulus, and the annulus is then filled from the top with grouting material. Air pressure may be maintained in the annulus sufficient to prevent ingress of water through the lower end of the jacket while grouting material is being introduced.*

[Compressed air is introduced into an annular space existing between the jacket and piling in the legs of an offshore structure so that water is expelled from the annular space through the lower end of the jacket and grouting material is then introduced into the annular space. The introduction of compressed air and grouting material is effected from above the waterline, thus avoiding the necessity of performing the grouting operation by divers at the sea bed.]





Re. 28,332  
METHOD AND APPARATUS FOR PREVENTING  
ICE DAMAGE TO MARINE STRUCTURES

Joseph F. Schirtzinger, Pasadena, Calif., assignor to  
Sea-Log Corporation, Pasadena, Calif.

Original No. 3,669,052, dated June 13, 1972, Ser. No.  
46,273, June 15, 1970. Application for reissue Oct.  
25, 1973, Ser. No. 409,747

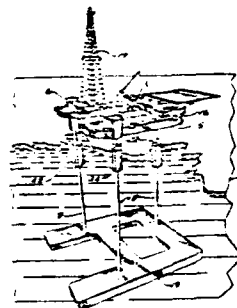
Int. Cl. B63b 35/08  
U.S. Cl. 114-5 R 15 Claims

A marine well drilling platform or the like having legs extending to the sea floor is protected from ice floes by comminuting devices at the water line for breaking the ice and thereby preventing crushing or overturning of the platform. The comminuting devices employ high velocity impacts against the ice to cause its fracture into chips as distinguished from cutting action. Rapidly rotating or reciprocating mechanisms with large "teeth" for making impact engagement with the ice are employed in separate embodiments. Comminuting devices mounted for sweeping adjacent a mooring buoy in one embodiment open a path through an ice floe for protecting the buoy and a ship moored at the buoy.

Reissued Feb. 11, 1975

Keywords: Ice protection; Offshore mooring structure; Offshore platform, fixed; Offshore platform, leg; Offshore structure fender

U.S. Cl. X.R. 9-8R; 61-1; 61-46; 114-42; 299-24



Re. 28,966  
SYSTEM AND BARRIER FOR CONTAINING AN OIL  
SPILL

Thomas Nicholas Blockwick, McLean, Va., assignor to Ocean Systems, Inc., Reston, Va.

Original No. 3,708,982, dated Jan. 9, 1973, Ser. No. 79,997,  
Oct. 21, 1970. Application for reissue Jan. 24, 1974, Ser.  
No. 436,146

Int. Cl. E02b 15/04  
U.S. Cl. 61-1 F 19 Claims

A system for containing an oil spill comprising a plurality of barrier modules each composed of a composite structure having a buoyant upper section and a water absorbing lower section which represents concurrently the sole ballast for said upper section and the subsurface barrier for the module.

Reissued Sept. 21, 1976

Keywords: Pollutant, surface barrier

U.S. Cl. X.R. 61-5; 114-.5F; 210-83

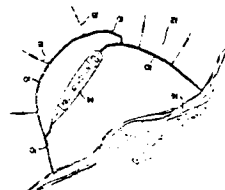
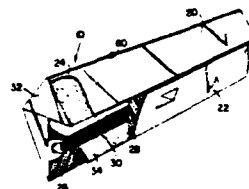


Figure from entry for original patent



Re. 28,978

FAIL-SAFE SUBSEA FLUID TRANSPORTATION SYSTEM  
Warren B. Brooks, Darien, Conn., assignor to Mobil Oil Corporation, New York, N.Y.  
Original No. 3,454,083, dated July 9, 1969, Ser. No. 649,935, June 29, 1967. Application for reissue Feb. 24, 1971, Ser. No. 118,251

Int. Cl. F21B 47/01, 15/02

U.S. Cl. 166-15

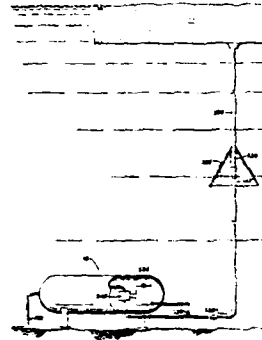
9 Claims

This specification discloses a subsea system for the production of fluid minerals. The system includes a product gathering network provided with production satellites in which the gas-oil-water ratios of each well are periodically tested and the flow rates are automatically controlled. A power distribution network connects a central power station, either floating or bottom supported, at the site or on land nearby, with the various satellite stations and submerged wellhead units. Provision is made for entry into the satellites and diver maintenance at the submerged wellheads. A rigid transportation pipe transports produced fluids to the water surface. At the lower end of the rigid transportation pipe is a designed break-away section which will be broken if excessive strain is encountered. An inverted funnel is located over the break away section to trap any escaping fluid.

Reissued Sept. 28, 1976

Keywords: Pollutant collection; Pollutant, submerged barrier; Seabed oil, process structure

U.S. Cl. X.R. 137-1



The original patent is not included in this collection. The devices covered by it, described in the above abstract, were not in relevant categories. The following claim is illustrative of new, applicable material in the reissued patent:

7. A method of recovering a fluid such as oil or the like escaping from a crack in a flowline or the like submerged in a body of water, the method comprising: locating a fluid containing container over and adjacent said crack; passing at least some of the fluid trapped within said container upwardly through a conduit to the surface of the water; and disposing of the fluid at the surface of the water.

Re. 28,989

ELECTROMAGNETIC WATER CURRENT METER  
Vincent J. Cushing, 9804 Hillridge Drive, Kensington, Md. 20795  
Original No. 3,759,097, dated Sept. 18, 1973, Ser. No. 68,674, Sept. 1, 1970. Application for reissue Dec. 10, 1974, Ser. No. 531,418

Int. Cl. G01F 1/58

U.S. Cl. 73-194 EM

22 Claims

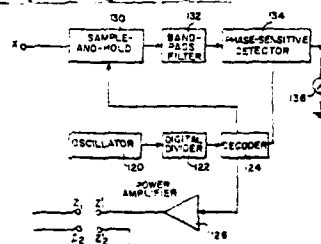
A body means of electrically non-conductive material supports at least one pair of electrically conductive detecting electrodes disposed at opposite portions of the body means. Means is supported within the body means between the electrodes for producing an alternating magnetic field. An electrical circuit is connected to the detecting electrodes and includes indicating means. In one form of the invention, electrically conductive guard means is disposed adjacent the electrodes and means is provided for establishing a potential on the guard means which is directly proportional to the potential on the detecting electrodes. In another form of the invention, means is provided for driving the electromagnet to produce an alternating magnetic field at a predetermined frequency wherein the magnetic field is driven to a finite value for a predetermined time interval during each cycle, and the

Reissued Oct. 5, 1976

Keywords: Current measurement

U.S. Cl. X.R. 73-181

electrical circuit includes means for measuring the signal from the detecting electrodes during a time delayed portion of said time interval. In a further form of the invention, pairs of oppositely disposed detecting electrodes are provided at right angles to one another so as to indicate the direction of water current flow. In each form of the invention, shield means is preferably employed in the form of electrically conductive material disposed between the detecting electrodes and the means for producing the magnetic field.



### III. SUBJECT INDEX, 1974-76

#### ARTIFICIAL SEAWEED

3803852 PROCESS FOR BUILDING AN ISLAND  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE ISLAND ;  
SEABED FOUNDATION

3820339 ARTIFICIAL SEAWEED CUT FROM CONTINUOUS BAND

#### ASPHALT

3861157 APPARATUS FOR DEPOSITING UNDER WATER A FLOWABLE HARDEFABLE  
OR NOT HARDEFABLE MASS. OTHER KEYWORDS: CONCRETE FORM ;  
SEABED MATERIAL PLACEMENT

#### BAR PROTECTION

3830066 APPARATUS AND SYSTEM FOR PRODUCING AND PROTECTING DEPOSITS  
OF SEDIMENTARY MATERIAL ON FLOORS OF BODIES OF WATER. OTHER KEYWORDS:  
FABRIC MAT

3842606 BEACH-PROTECTORS  
OTHER KEYWORDS: LOW-COST SHORE PROTECTION ; TIRES ;  
WAVE ABSORBER BEACH

3844123 DEVICE FOR PRODUCING AND PROTECTING DEPOSITS OF SEDIMENTARY MATERIAL  
ON THE FLOOR OF BODIES OF WATER. OTHER KEYWORDS: FABRIC MAT ,  
SEABED SCOUR PROTECTION

3844125 ANTI-EROSION DEVICE  
OTHER KEYWORDS: BREAKWATER, STEEL FRAME ; SAND FENCE ;  
SEABED FOUNDATION

3845630 MECHANICAL REEF  
OTHER KEYWORDS: BREAKWATER, STEEL FRAME

3888209 ARTIFICIAL REEF  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; SEABED FOUNDATION

3892075 APPARATUS FOR VORTEX GENERATION TO PRECIPITATE SUSPENDED  
PARTICLES IN FLUID BODIES. OTHER KEYWORDS: BREAKWATER, STEEL FRAME

3927533 UNDERWATER WALL STRUCTURE  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; GROIN ; PILE, CONCRETE ;  
PILE, SHEET

3928978 APPARATUS FOR PRODUCING AND PROTECTING DEPOSITS  
OF SEDIMENTARY MATERIAL ON FLOORS OF BODIES OF WATER  
OTHER KEYWORDS: FABRIC MAT ; SEABED SCOUR PROTECTION

3971221 BREAKWATER SYSTEM FOR CREATING ARTIFICIAL SANDBARS  
OTHER KEYWORDS: BREAKWATER, FLOATING

#### BATHYTHERMOGRAPH

3820391 DEEP SEA PRESSURE GAUGE  
OTHER KEYWORDS: DEPTH PRESSURE MEASUREMENT ; INSTRUMENT RETRIEVAL

3878456 STANDARD CONDUCTIVITY CELL FOR MEASUREMENT OF SEAWATER SALINITY  
AND TEMPERATURE. OTHER KEYWORDS: SALINITY MEASUREMENT

3906354 STANDARD CONDUCTIVITY CELL FOR MEASUREMENT OF SEA WATER SALINITY  
AND TEMPERATURE. OTHER KEYWORDS: SALINITY MEASUREMENT

3926056 CONDUCTIVITY, TEMPERATURE AND PRESSURE MEASURING SYSTEM  
OTHER KEYWORDS: DEPTH PRESSURE MEASUREMENT ; SALINITY MEASUREMENT

3935592 RECORDING INSTRUMENT ADAPTED FOR USE IN REMOTE UNATTENDED LOCATIONS  
OTHER KEYWORDS: BUOY, INSTRUMENTED ; DEPTH PRESSURE MEASUREMENT

**BREAKWATER, CONCRETE**

3820343 SELF-SUPPORTING WALL  
OTHER KEYWORDS: GROIN ; LOW-COST SHORE PROTECTION ; SEAWALL

3844122 PROTECTED OFFSHORE STORAGE FACILITY  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, EMERGENT ;  
POLLUTANT COLLECTION

3844124 CONTROL OF EROSION  
OTHER KEYWORDS: CONCRETE ARMOR UNIT ; LOW-COST SHORE PROTECTION ;  
WAVE ABSORBER BEACH

3846988 SWELL DAMPER  
OTHER KEYWORDS: OFFSHORE CAISSON ; SEAWALL

3849990 ANTI-HEAVE PROTECTIVE SYSTEM  
OTHER KEYWORDS: OFFSHORE CAISSON ; SEAWALL

3875750 MODULAR EROSION CONTROL DEVICE

3878684 DEVICES FOR PROTECTING THE BASES OF STRUCTURES IMMERSED  
IN A VOLUME OF WATER; AGAINST UNDERMINING. OTHER KEYWORDS:  
SEABED SCOUR PROTECTION ; SEAWALL

3888209 ARTIFICIAL REEF  
OTHER KEYWORDS: BAR PROTECTION ; SEABED FOUNDATION

3889476 SUBMERSIBLE CAISSONS AND THEIR APPLICATIONS  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE CONSTRUCTION ;  
OFFSHORE STORAGE TANK, EMERGENT

3894397 BEACH EROSION CONTROL STRUCTURE  
OTHER KEYWORDS: CONCRETE BLOCK ; LOW-COST SHORE PROTECTION ; SEAWALL

3913333 MEANS AND APPARATUS FOR CONTROLLING FLUID CURRENTS AND SELECTIVELY  
PRESERVING AND MODIFYING TOPOGRAPHY SUBJECTED THERETO  
OTHER KEYWORDS: CHANNEL PROTECTION ; DUNE PROTECTION ; SAND FENCE ;  
SEAWALL ; TIDAL INLET

3921408 ANTI-HEAVE PROTECTIVE SYSTEM  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ;  
OFFSHORE STORAGE TANK, EMERGENT ; SEAWALL

3927533 UNDERWATER WALL STRUCTURE  
OTHER KEYWORDS: BAR PROTECTION ; GROIN ; PILE, CONCRETE ; PILE, SHEET

3953976 SELF-SUPPORTING WALL  
OTHER KEYWORDS: GROIN ; LOW-COST SHORE PROTECTION ; SEAWALL

3958426 OFFSHORE HARBOR TANK AND INSTALLATION  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE HARBOR ;  
OFFSHORE STORAGE TANK, EMERGENT

3969900 BREAKWATER CONSTRUCTION  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE CONSTRUCTION ;  
SEABED FOUNDATION

3984989 MEANS FOR PRODUCING SUBAQUEOUS AND OTHER CAST-IN-PLACE CONCRETE  
STRUCTURES IN SITU.OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ;  
OFFSHORE CONSTRUCTION ; PILE, CONCRETE ; SEAWALL ; STRUCTURE REPAIR

**BREAKWATER, FLOATING**

3785159 ATTENUATION OF WATER WAVES AND CONTROL AND UTILIZATION  
OF WAVE-INDUCED WATER MOVEMENTS.OTHER KEYWORDS:  
BREAKWATER, STEEL FRAME ; POLLUTANT COLLECTION ; POLLUTANT DISPERSION ;  
POLLUTANT, SURFACE BARRIER ; POWER, WAVE

3791150 FLOATING BREAKWATER FOR ATTENUATING SEAS

3800543 OFFSET BREAKWATER CONFIGURATION

3846990 FLOATING WAVE BARRIER  
OTHER KEYWORDS: BUOY MOORING SYSTEM

3848419 FLOATING WAVE BARRIER  
OTHER KEYWORDS: BUOY MOORING SYSTEM

3863455 FLOATABLE BREAKWATER

3864920 FLOATING BREAKWATER

3877233 FLOATING BREAKWATER SYSTEM  
OTHER KEYWORDS: LOW-COST SHORE PROTECTION

3884042 FLOATING BREAKWATER  
OTHER KEYWORDS: LOW-COST SHORE PROTECTION ; TIRES

3908384 BREAKWATERS FOR LONG, SHORT AND/OR COMPLEX WATER WAVES  
OTHER KEYWORDS: BREAKWATER, STEEL FRAME

3952521 PORTABLE FLOATING WAVE TRIPPER  
OTHER KEYWORDS: BREAKWATER, STEEL FRAME

3953977 DEVICE FOR DAMPING WAVES  
OTHER KEYWORDS: BREAKWATER, STEEL FRAME ; TIRES

3969901 FLOATING BREAKWATERS

3971221 BREAKWATER SYSTEM FOR CREATING ARTIFICIAL SANDBARS  
OTHER KEYWORDS: BAR PROTECTION

3991576 FLOATING BREAKWATER

**BREAKWATER, PNEUMATIC**

3803849 METHOD AND APPARATUS FOR DAMPING WAVE ACTION

3822555 MARINA PROTECTIVE WAVE BREAKER

**BREAKWATER, STEEL FRAME**

3785159 ATTENUATION OF WATER WAVES AND CONTROL AND UTILIZATION  
OF WAVE-INDUCED WATER MOVEMENTS.OTHER KEYWORDS:  
BREAKWATER, FLOATING ; POLLUTANT COLLECTION ; POLLUTANT DISPERSION ;  
POLLUTANT, SURFACE BARRIER ; POWER, WAVE

3835651 LITTORAL FLOW TRAP OR BASIN  
OTHER KEYWORDS: BULKHEAD ; GROIN ; SEAWALL

3844125 ANTI-EROSION DEVICE  
OTHER KEYWORDS: BAR PROTECTION ; SAND FENCE ; SEABED FOUNDATION

3845630 MECHANICAL REEF  
OTHER KEYWORDS: BAR PROTECTION

3851476 METHOD AND APPARATUS FOR BREAKING WAVES  
OTHER KEYWORDS: SEABED FOUNDATION

3892075 APPARATUS FOR VORTEX GENERATION TO PRECIPITATE SUSPENDED PARTICLES  
IN FLUID BODIES. OTHER KEYWORDS: BAR PROTECTION

3908384 BREAKWATERS FOR LONG, SHORT AND/OR COMPLEX WATER WAVES  
OTHER KEYWORDS: BREAKWATER, FLOATING

3952521 PORTABLE FLOATING WAVE TRIPPER  
OTHER KEYWORDS: BREAKWATER, FLOATING

3953977 DEVICE FOR DAMPING WAVES  
OTHER KEYWORDS: BREAKWATER, FLOATING ; TIRES

#### BULKHEAD

3835651 LITTORAL FLOW TRAP OR BASIN  
OTHER KEYWORDS: BREAKWATER, STEEL FRAME ; GROIN ; SEAWALL

3995434 WAVE DISSIPATING WALL  
OTHER KEYWORDS: CONCRETE BLOCK ; SEAWALL

#### BUOY MOORING SYSTEM

3818524 DEEP-SEA SLACK WIPE MOORING SYSTEM  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT

3846990 FLOATING WAVE BARRIER  
OTHER KEYWORDS: BREAKWATER, FLOATING

3848226 HIGH CAPACITY UNDERWATER ACOUSTIC RELEASE  
OTHER KEYWORDS: INSTRUMENT RETRIEVAL

3848419 FLOATING WAVE BARRIER  
OTHER KEYWORDS: BREAKWATER, FLOATING

3848464 UNDERWATER MEASURING BUOY SYSTEM  
OTHER KEYWORDS: BUOY, INSTRUMENTED

3906564 REMOTELY CONTROLLED UNDERWATER INSTRUMENT SYSTEM  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT

3906790 APPARATUS FOR MEASURING FLUIDIC CURRENT  
OTHER KEYWORDS: CURRENT MEASUREMENT ; INSTRUMENT DEPLOYMENT

3918260 WAVED-POWERED DRIVING APPARATUS  
OTHER KEYWORDS: POWER, WAVE

3927562 ENVIRONMENTAL PROFILER  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ; INSTRUMENT RETRIEVAL

3946695 SELF-DEPLOYING MULTIPLE ANCHOR MOORING SYSTEMS

3955412 WATER CURRENT FORCE MEASURING APPARATUS  
OTHER KEYWORDS: BUOY, INSTRUMENTED ; CURRENT MEASUREMENT ;  
WAVE MEASUREMENT

3961389 DEPTH REGULATING APPARATUS  
OTHER KEYWORDS: BUOY, INSTRUMENTED

3971251 DYNAMICALLY BALANCED APPARATUS FOR WATER BORNE INSTRUMENTS  
OTHER KEYWORDS: CURRENT MEASUREMENT ; INSTRUMENT DEPLOYMENT

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- 3789445 BUOY CONSTRUCTION
- 3800219 METHOD AND APPARATUS FOR DETECTING OIL POLLUTION IN WATER  
OTHER KEYWORDS: POLLUTANT MEASUREMENT
- 3800601 SEA SENSOR AND DESCRIPTOR SYSTEM  
OTHER KEYWORDS: WAVE MEASUREMENT
- 3828380 FIXED FREEBOARD SPAR BUOY
- 3848464 UNDERWATER MEASURING BUOY SYSTEM  
OTHER KEYWORDS: BUOY MOORING SYSTEM
- 3885418 METHOD AND APPARATUS FOR DETECTING THE PRESENCE OF AN OIL SLICK  
ON A WATER SURFACE. OTHER KEYWORDS: POLLUTANT MEASUREMENT
- 3906565 DRIFTING OCEAN BUOY  
OTHER KEYWORDS: CURRENT MEASUREMENT
- 3916674 OIL-SPILL DETECTION SYSTEM  
OTHER KEYWORDS: POLLUTANT MEASUREMENT ;  
POLLUTANT, MECHANICAL REMOVAL
- 3922739 APPARATUS FOR CONVERTING SEA WAVE ENERGY INTO ELECTRICAL ENERGY  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; INSTRUMENT POWER SUPPLY ;  
POWER, WAVE
- 3935592 RECORDING INSTRUMENT ADAPTED FOR USE IN REMOTE UNATTENDED LOCATIONS  
OTHER KEYWORDS: BATHYTHERMOGRAPH ; DEPTH PRESSURE MEASUREMENT
- 3937078 SENSING APPARATUS FOR INCLINOMETERS  
OTHER KEYWORDS: CURRENT MEASUREMENT
- 3952349 VARIABLE BUOYANCY DEVICE  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT
- 3953905 STABILIZED ; TOWABLE SPAR BUOY  
OTHER KEYWORDS: TOWED VEHICLE
- 3955412 WATER CURRENT FORCE MEASURING APPARATUS  
OTHER KEYWORDS: BUOY MOORING SYSTEM ; CURRENT MEASUREMENT ;  
WAVE MEASUREMENT
- 3961389 DEPTH REGULATING APPARATUS  
OTHER KEYWORDS: BUOY MOORING SYSTEM
- 3983750 FLUID LEVEL SENSING DEVICE  
OTHER KEYWORDS: WAVE MEASUREMENT
- 3992737 SUSPENSION SYSTEM FOR UNDERWATER EQUIPMENT  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT

**CATHODIC PROTECTION**

- 3841988 CONTROL FOR IMPRESSED CURRENT CATHODIC PROTECTION SYSTEMS  
OTHER KEYWORDS: CORROSION PREVENTION
- 3868313 CATHODIC PROTECTION  
OTHER KEYWORDS: COATING ; CORROSION PREVENTION
- 3870615 SACRIFICIAL ANODE  
OTHER KEYWORDS: CORROSION PREVENTION
- 3992272 SUBMERGED OFFSHORE PLATFORM JOINT PROTECTION  
OTHER KEYWORDS: COATING ; CORROSION PREVENTION ;  
OFFSHORE PLATFORM, LEG

3994795 SACRIFICIAL ANODE  
OTHER KEYWORDS: CORROSION PREVENTION

#### CHANNEL BARRIER

3786638 INFLATABLE DAMS AND DAM UNITS  
OTHER KEYWORDS: TIDAL ESTUARY WATER LEVEL ; TIDAL INLET

3974654 SELF-REGULATING TIDE GATE  
OTHER KEYWORDS: TIDAL ESTUARY WATER LEVEL

3993913 TIDEWATER POWER SYSTEM  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; POWER, TIDE ;  
TIDAL ESTUARY WATER LEVEL

#### CHANNEL PROTECTION

3913333 MEANS AND APPARATUS FOR CONTROLLING FLUID CURRENTS AND SELECTIVELY  
PRESERVING AND MODIFYING TOPOGRAPHY SUBJECTED THERETO  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; DUNE PROTECTION ;  
SAND FENCE ; SEAWALL ; TIDAL INLET

3984987 SILT AND POLLUTION CONTROL FOR MARINE FACILITY  
OTHER KEYWORDS: PIER, FIXED ; POLLUTANT, SUBMERGED BARRIER ;  
POLLUTANT, SURFACE BARRIER

#### COATING

3785847 PROCESS FOR ANTI-CORROSIIVE PROTECTION BY REDUCTION  
OF IONISED METALS ON METAL SUBSTRATE.OTHER KEYWORDS:  
CORROSION PREVENTION

3808031 MULTI-METAL CORROSION-RESISTANT DIFFUSION COATINGS  
OTHER KEYWORDS: CORROSION PREVENTION

3860987 DEVICE FOR APPLYING A PROTECTIVE COATING TO AN IMMERGED SURFACE.  
OTHER KEYWORDS: STRUCTURE REPAIR

3861949 ARTICLE HAVING APPLIED TO THE SUPFACE THEREOF, AN ANTI-FOULING  
COMPOSITION COMPRISING A POLYMER AND AN ORGANO-TIN COMPOUND  
OTHER KEYWORDS: FOULING PREVENTION

3864153 WATER RESISTING AND ANTICORROSIIVE PAINTING METHOD AND  
THE PAINTED ARTICLES.OTHER KEYWORDS: CORROSION PREVENTION

3868268 UNDER-WATER SPRAYING  
OTHER KEYWORDS: STRUCTURE REPAIR

3868313 CATHODIC PROTECTION  
OTHER KEYWORDS: CATHODIC PROTECTION ; CORROSION PREVENTION

3890795 KIT OF COMPONENTS AND A METHOD OF PROTECTING STEEL PILING  
FROM CORROSION.OTHER KEYWORDS: CORROSION PREVENTION ; PILE, STEEL

3896753 HYDROPHILIC POLYMER COATING FOR UNDERWATER STRUCTURES  
OTHER KEYWORDS: FOULING PREVENTION

3939665 METHOD FOR PROTECTING METAL H-PIILING IN UNDERWATER ENVIRONMENTS  
AND PROTECTED H-PIILING.OTHER KEYWORDS: CORROSION PREVENTION ;  
PILE, STEEL

3972199 LOW ADHESIONAL ARCTIC OFFSHORE PLATFORM  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE STRUCTURE FENDER



3992272 SUBMERGED OFFSHORE PLATFORM JOINT PROTECTION  
OTHER KEYWORDS: CATHODIC PROTECTION ; CORROSION PREVENTION ;  
OFFSHORE PLATFORM, LEG

3996757 APPARATUS FOR PROTECTING METALLIC STRUCTURAL ELEMENTS  
AGAINST CORROSION, OTHER KEYWORDS: CORROSION PREVENTION ;  
PILE PROTECTION ; PILE, STEEL

3999399 PROTECTIVE GUARD MEANS FOR WOOD PILING AND A METHOD  
OF INSTALLING SAME UNDER DRY WORKING CONDITIONS  
OTHER KEYWORDS: COLLISION PROTECTION ; FOULING PREVENTION ;  
PIER FENDER ; PILE PROTECTION ; PILE, WOOD

#### COFFERDAM

3870010 MOORING SYSTEM FOR FLOATING STRUCTURES  
OTHER KEYWORDS: OFFSHORE MOORING STRUCTURE ; OFFSHORE PLATFORM ANCHOR

3871181 METHOD OF FORMING AN ENCLOSURE IN A BODY OF WATER  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, JACK UP ;  
OFFSHORE STORAGE TANK, EMERGENT ; PILE, SHEET ; PILE, STEEL

#### COLLISION PROTECTION

3945633 INTERCEPTOR FOR PREVENTING SHIP COLLISIONS  
WITH OFFSHORE POWER STATIONS AND TEE LIKE  
OTHER KEYWORDS: OFFSHORE STRUCTURE FENDER

3901040 COLLISION BUMPER FOR OFFSHORE STRUCTURES  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, EMERGENT ;  
OFFSHORE STRUCTURE FENDER

3991582 ROTATING-BUMPER FENDER SYSTEM  
OTHER KEYWORDS: OFFSHORE STRUCTURE FENDER

3995437 SHOCK ABSORBING ARRANGEMENT FOR A MARINE STRUCTURE  
OTHER KEYWORDS: OFFSHORE STRUCTURE FENDER ; PIER FENDER ;  
PILE PROTECTION

3999399 PROTECTIVE GUARD MEANS FOR WOOD PILING AND A METHOD  
OF INSTALLING SAME UNDER DRY WORKING CONDITIONS. OTHER KEYWORDS:  
COATING ; FOULING PREVENTION ; PIER FENDER ;  
PILE PROTECTION ; PILE, WOOD

#### CONCRETE ARMOR UNIT

3844124 CONTROL OF EROSION  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; LOW-COST SHORE PROTECTION ;  
WAVE ABSORBER BEACH

3851477 DEVICE FOR PROTECTING WORKS AGAINST LIQUID MASSES

3990247 SYSTEM OF STRUCTURES TO RESIST HYDRODYNAMIC FORCES  
OTHER KEYWORDS: REVETMENT

#### CONCRETE BLOCK

3802205 SEA WALL CONSTRUCTION  
OTHER KEYWORDS: PILE, STEEL ; SEAWALL

3894397 BEACH EROSION CONTROL STRUCTURE  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; LOW-COST SHORE PROTECTION ;  
SEAWALL

- 3896624 POLYHEDRAL, POROUS, AND HOLLOW BLOCK  
OTHER KEYWORDS: SEABED FOUNDATION
- 3903702 REVETMENT STRUCTURE  
OTHER KEYWORDS: LOW-COST SHORE PROTECTION ; REVETMENT ;  
SLOPE PROTECTION
- 3922865 MATTRESS, METHOD OF SINKING A MATTRESS AND VESSEL SUITABLE  
FOR USE IN SAID METHOD.OTHER KEYWORDS: FABRIC MAT ;  
SEABED MATERIAL PLACEMENT ; SLOPE PROTECTION
- 3995434 WAVE DISSIPATING WALL  
OTHER KEYWORDS: BULKHEAD ; SEAWALL

#### CONCRETE FORM

- 3786640 MEANS AND METHOD FOR PRODUCING STEPPED CONCRETE SLOPE STRUCTURES  
OTHER KEYWORDS: FABRIC MAT ; LOW-COST SHORE PROTECTION ;  
REVTMENT ; SANDBAG ; SLOPE PROTECTION
- 3791153 METHOD FOR PLACING HYDRAULIC CONCRETE  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; SEABED MATERIAL PLACEMENT
- 3798867 STRUCTURAL METHOD AND APPARATUS  
OTHER KEYWORDS: PILE, STEEL ; STRUCTURE REPAIR
- 3837169 REINFORCED MATTRESS FOR PROTECTING SHORELINES AND THE LIKE  
OTHER KEYWORDS: FABRIC MAT ; REVETMENT
- 3861157 APPARATUS FOR DEPOSITING UNDER WATER A FLOWABLE HARDENABLE  
OR NOT HARDENABLE MASS.OTHER KEYWORDS: ASPHALT ;  
SEABED MATERIAL PLACEMENT
- 3861158 SUBMERGED PIPELINE STABILIZATION  
OTHER KEYWORDS: SANDBAG ; SEABED FOUNDATION ;  
SEABED PIPELINE PLACEMENT
- 3871182 METHOD OF PROTECTION FOR SLOPES AND CRESTS OF RIVERS, CHANNELS,  
AND THE LIKE.OTHER KEYWORDS: FABRIC MAT ; REVETMENT ;  
SEABED MATERIAL PLACEMENT ; SLOPE PROTECTION
- 3886751 AQUATIC CONSTRUCTION MODULE AND METHOD OF FORMING THEREOF  
OTHER KEYWORDS: LOW-COST SHORE PROTECTION ; SANDBAG
- 3893304 METHOD AND A DEVICE FOR THE UNDERWATER CONSTRUCTION  
OF CONCRETE STRUCTURES.OTHER KEYWORDS: FABRIC MAT ;  
OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FIXED ;  
SEABED MATERIAL PLACEMENT
- 3906734 FIXED MARINE PLATFORM WITH DISPERSED BASE  
OTHER KEYWORDS: FABRIC MAT ; OFFSHORE PLATFORM, FIXED ;  
SEABED FOUNDATION ; SEABED SCOUR PROTECTION
- 3934422 PILE SPLICING APPARATUS AND METHOD  
OTHER KEYWORDS: PILE, CONCRETE ; PILE, WOOD ; STRUCTURE REPAIR
- 3938342 METHOD AND A DEVICE FOR BUILDING IMMERSED FOUNDATIONS  
OTHER KEYWORDS: GROUTING ; OFFSHORE CONSTRUCTION ;  
SEABED FOUNDATION ; SEABED MATERIAL PLACEMENT
- 3955372 METHOD OF INSTALLING A FIXED MARINE PLATFORM WITH DISPERSED BASE  
OTHER KEYWORDS: FABRIC MAT ; OFFSHORE PLATFORM, FIXED ;  
SEABED FOUNDATION ; SEABED MATERIAL PLACEMENT ;  
SEABED SCOUR PROTECTION

3984989 MEANS FOR PRODUCING SUBAQUEOUS AND OTHER CAST-IN-PLACE CONCRETE  
STRUCTURES IN SITU.OTHER KEYWORDS: BREAKWATER, CONCRETE ;  
FABRIC MAT ; OFFSHORE CONSTRUCTION ; PILE, CONCRETE ; SEAWALL ;  
STRUCTURE REPAIR

#### CORROSION PREVENTION

3785847 PROCESS FOR ANTI-CORROSION PROTECTION BY REDUCTION  
OF IONISED METALS ON METAL SUBSTRATE.OTHER KEYWORDS: COATING

3808031 MULTI-METAL CORROSION-RESISTANT DIFFUSION COATINGS  
OTHER KEYWORDS: COATING

3841988 CONTROL FOR IMPRESSED CURRENT CATHODIC PROTECTION SYSTEMS  
OTHER KEYWORDS: CATHODIC PROTECTION

3864153 WATER RESISTING AND ANTICORROSION PAINTING METHOD  
AND THE PAINTED ARTICLES.OTHER KEYWORDS: COATING

3868313 CATHODIC PROTECTION  
OTHER KEYWORDS: CATHODIC PROTECTION ; COATING

3870009 PROTECTIVE COVERING APPARATUS FOR A SUBMERGED STRUCTURE  
OTHER KEYWORDS: FOULING PREVENTION

3870615 SACRIFICIAL ANODE  
OTHER KEYWORDS: CATHODIC PROTECTION

3890795 KIT OF COMPONENTS AND A METHOD OF PROTECTING STEEL PILING  
FROM CORROSION.OTHER KEYWORDS: COATING ; PILE, STEEL

3939665 METHOD FOR PROTECTING METAL H-PILING IN UNDERWATER ENVIRONMENTS  
AND PROTECTED H-PILING.OTHER KEYWORDS: COATING ; PILE, STEEL

3940339 LITHIUM BORATE COMPLEX GREASE EXHIBITING SALT WATER  
CORROSION RESISTANCE

3992272 SUBMERGED OFFSHORE PLATFORM JOINT PROTECTION  
OTHER KEYWORDS: CATHODIC PROTECTION ; COATING ;  
OFFSHORE PLATFORM, LEG

3994795 SACRIFICIAL ANODE  
OTHER KEYWORDS: CATHODIC PROTECTION

3996757 APPARATUS FOR PROTECTING METALLIC STRUCTURAL ELEMENTS  
AGAINST CORROSION.OTHER KEYWORDS: COATING ; PILE PROTECTION ;  
PILE, STEEL

#### CURRENT MEASUREMENT

3834229 METHOD AND APPARATUS FOR MEASURING WATER CURRENTS  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT

3854333 METHOD FOR DETERMINING DIRECTION AND SPEED OF OCEAN CURRENTS

3861211 ULTRA-LOW FLOW VELOCITY CURRENT METER

3869911 WATER CURRENT OR TIDE DIRECTION-OF-FLOW INDICATOR  
OTHER KEYWORDS: TIDE MEASUREMENT

3906565 DRIFTING OCEAN BUOY  
OTHER KEYWORDS: BUOY, INSTRUMENTED

3906790 APPARATUS FOR MEASURING FLUIDIC CURRENT  
OTHER KEYWORDS: BUOY MOORING SYSTEM ; INSTRUMENT DEPLOYMENT

3929015 LINE MOTION AND WATER CURRENT DISC SENSOR  
 3937078 SENSING APPARATUS FOR INCLINOMETERS  
 OTHER KEYWORDS: BUOY, INSTRUMENTED  
 3949605 ACOUSTIC CURRENT/FLOW MEASURING SYSTEM  
 3955412 WATER CURRENT FORCE MEASURING APPARATUS  
 OTHER KEYWORDS: BUOY, INSTRUMENTED ; BUOY MOORING SYSTEM ;  
 WAVE MEASUREMENT  
 3971251 DYNAMICALLY BALANCED APPARATUS FOR WATER BORNE INSTRUMENTS  
 OTHER KEYWORDS: BUOY MOORING SYSTEM ; INSTRUMENT DEPLOYMENT  
 3972231 METHOD FOR MEASURING VELOCITY AND DIRECTION OF CURRENTS  
 IN A BODY OF WATER.OTHER KEYWORDS: INSTRUMENT DEPLOYMENT  
 3978726 FLUID CURRENT METER  
 3995480 THERMAL SENSOR FOR MEASUREMENT OF OCEAN CURRENT DIRECTION  
 RE28989 ELECTROMAGNETIC WATER CURRENT METER

#### DEPTH PRESSURE MEASUREMENT

3820391 DEEP SEA PRESSURE GAUGE  
 OTHER KEYWORDS: BATHYTHERMOGRAPH ; INSTRUMENT RETRIEVAL  
 3841156 COMBINED DEPTH INDICATOR AND WATER SAMPLER  
 OTHER KEYWORDS: INSTRUMENT, TOWED ; SAMPLER, WATER ; TOWED VEHICLE  
 3926056 CONDUCTIVITY, TEMPERATURE AND PRESSURE MEASURING SYSTEM  
 OTHER KEYWORDS: BATHYTHERMOGRAPH ; SALINITY MEASUREMENT  
 3935592 RECORDING INSTRUMENT ADAPTED FOR USE IN REMOTE UNATTENDED LOCATIONS  
 OTHER KEYWORDS: BATHYTHERMOGRAPH ; BUOY, INSTRUMENTED  
 3996794 DIFFERENTIAL DEPTH INDICATOR  
 OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ; SEABED PIPELINE PLACEMENT ;  
 SEABED SITE SURVEY

#### DREDGE INTAKE

3787144 EXPLOSIVE PUMPING AND DREDGING METHOD AND APPARATUS  
 OTHER KEYWORDS: DREDGE, SUCTION ; PUMP ; SEABED TRENCHER  
 3791763 PUMP USED IN DREDGING SYSTEMS OPERATING WITH COMPRESSED AIR  
 OTHER KEYWORDS: DREDGE, SUCTION ; PUMP  
 3803856 PROCESS AND APPARATUS FOR ACHIEVING THE MECHANICAL TRENCHING  
 OF A PIPE-LINE IN A SUB-AQUEOUS DEPTH.OTHER KEYWORDS:  
 DREDGE, SUCTION ; PUMP ; SEABED PIPELINE PLACEMENT ; SEABED TRENCHER  
 3807066 CUTTER HEAD FOR SUCTION DREDGE  
 OTHER KEYWORDS: DREDGE, CUTTERHEAD  
 3808716 DREDGE CUTTERHEAD  
 OTHER KEYWORDS: DREDGE, CUTTERHEAD  
 3823495 ROTATABLY DRIVEN CUTTER FOR A SUCTION DREDGER  
 OTHER KEYWORDS: DREDGE, CUTTERHEAD  
 3842521 SUBMERSIBLE DREDGING PUMP AND SHOVEL ARRANGEMENT WITH SUSPENSION  
 AND TOWING MEANS THEREFOR.OTHER KEYWORDS: DREDGE, SUCTION ; PUMP  
 3857651 PUMPING UNITS FOR CYCLONIC ELEVATOR  
 OTHER KEYWORDS: DREDGE, CUTTERHEAD ; DREDGE, SUCTION ; PUMP

3877159 ROTARY DISK CUTTER FOR A CUTTER DREDGE  
OTHER KEYWORDS: DREDGE, CUTTERHEAD

3885330 EXCAVATOR FOR DIGGING A HOLE BENEATH THE WATER  
OTHER KEYWORDS: DREDGE, CUTTERHEAD

3896566 SUBMARINE DIGGING WHEEL WHICH DISCHARGES MATERIAL IN AN AIR CHAMBER  
OTHER KEYWORDS: DREDGE, CUTTERHEAD

3905137 UNDERWATER TRACTOR AND IMPLEMENT THEREFOR  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE, SUBMERGED

3909960 LOOSE MATERIAL RECOVERY SYSTEM HAVING A MIXING BOX  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; DREDGE, SUCTION

3919790 PUSHED SUCTION DREDGER AND BARGE COMBINATION  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; DREDGE PROPULSION ; PUMP

3945761 FAN DISTURBING SAND AT THE BOTTOM OF A BODY OF WATER  
SO THAT IT MAY BE PUMPED UP EFFICIENTLY. OTHER KEYWORDS:  
DREDGE, CUTTERHEAD

3950030 UNDERWATER MINING  
OTHER KEYWORDS: DREDGE, SUCTION

3958346 MULTIPLE PUMPING CHAMBER DREDGING APPARATUS  
OTHER KEYWORDS: DREDGE, SUCTION ; PUMP ; SAMPLER, SEABED GRAB

3962803 DREDGING HEAD  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; PUMP ; WATER PLANT REMOVAL

3971148 DREDGE CUTTERHEAD  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; WATER PLANT REMOVAL

3988843 MINING TRANSITION CHAMBER  
OTHER KEYWORDS: DREDGE, SUCTION

3994082 AIR OPERATED DREDGING APPARATUS  
OTHER KEYWORDS: DREDGE, SUCTION ; PUMP

3999313 TOWED-SLED FOR DEEP-SEA PARTICLE HARVEST  
OTHER KEYWORDS: DREDGE, MECHANICAL

#### DREDGE LADDER CONTROL

3797139 FLOATING DREDGE MOTION COMPENSATOR  
OTHER KEYWORDS: DREDGE, CUTTERHEAD

3821859 DREDGE LADDER SHOCK MOUNTING ARRANGEMENTS  
OTHER KEYWORDS: DREDGE, CUTTERHEAD

3867772 METHOD OF EXCAVATING TO FORM OR ENLARGE A WATERWAY  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; WATER PLANT REMOVAL

3874101 DREDGER WITH ADJUSTABLE ENDLESS DIGGER AND ROTARY MUD SLINGER  
OTHER KEYWORDS: DREDGE, MECHANICAL ; DREDGE PROPULSION ;  
DREDGE-SPOIL TRANSPORT

3893249 SUCTION DREDGING WITH SWELL COMPENSATION  
OTHER KEYWORDS: DREDGE, SUCTION

3908290 HYDRAULIC DREDGING SYSTEM AND METHOD FOR COLLECTING  
AND REMOVING MATERIAL FROM DEEP SEA BEDS. OTHER KEYWORDS:  
DREDGE, SUCTION

3908291 APPARATUS FOR PREVENTING TANGLE OF ENDLESS ROPE IN MINING  
OR SEA LIFE GATHERING. OTHER KEYWORDS: DREDGE, MECHANICAL

3919791 DREDGER HAVING SEPARATELY FLOATING DREDGE AND TAIL SECTIONS  
AND METHOD OF DREDGING. OTHER KEYWORDS: DREDGE, CUTTERHEAD ;  
DREDGE PROPULSION

3920137 EXCAVATING MACHINE WITH CLAMSHELL BUCKET  
OTHER KEYWORDS: DREDGE, MECHANICAL

3949496 WAVE COMPENSATING SYSTEM FOR SUCTION DREDGERS  
OTHER KEYWORDS: DREDGE, SUCTION

3956834 DREDGE LADDER SHOCK MOUNTING ARRANGEMENTS  
OTHER KEYWORDS: DREDGE, CUTTERHEAD

3959898 DREDGE LADDER SHOCK MOUNTING ARRANGEMENT

#### DREDGE PIPE

3820258 APPARATUS AND METHOD FOR DREDGING, RETENTION, TRANSPORT  
AND DISPOSAL OF DREDGE MATERIAL. OTHER KEYWORDS:  
DREDGE-SPOIL TRANSPORT ; HOPPER BARGE

3828451 DUCTING SYSTEM FOR SUCTION DREDGERS HAVING PIVOTALLY CONNECTED  
TUBE LENGTHS. OTHER KEYWORDS: DREDGE, SUCTION

3921238 DREDGE PIPE FLOTATION

3990379 DREDGING APPARATUS  
OTHER KEYWORDS: DREDGE, SUCTION

3992735 FLOTATION RING FOR DREDGE PIPE LINES

#### DREDGE PROPULSION

3822558 ARCTIC DREDGING AND PIPELAYING  
OTHER KEYWORDS: ICE PROTECTION ; SEABED PIPELINE PLACEMENT ;  
SEABED TRENCHER

3874101 DREDGER WITH ADJUSTABLE ENDLESS DIGGER AND ROTARY MUD SLINGER  
OTHER KEYWORDS: DREDGE LADDER CONTROL ; DREDGE, MECHANICAL ;  
DREDGE-SPOIL TRANSPORT

3885331 DREDGING BARGE HAVING DIGGING JETS AND STEERING JETS  
OTHER KEYWORDS: DREDGE, SUCTION ; SEABED TRENCHER

3897619 VEHICLE FOR UNDERWATER EXCAVATION BENEATH A STRUCTURE  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE, SUBMERGED ;  
OFFSHORE CONSTRUCTION ; SEABED FOUNDATION

3902448 DREDGE HAVING IMPROVED PROPELLING MEANS  
OTHER KEYWORDS: DREDGE, CUTTERHEAD

3919790 PUSHED SUCTION DREDGER AND BARGE COMBINATION  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; DREDGE INTAKE ; PUMP

3919791 DREDGER HAVING SEPARATELY FLOATING DREDGE AND TAIL SECTIONS  
AND METHOD OF DREDGING. OTHER KEYWORDS: DREDGE, CUTTERHEAD ;  
DREDGE LADDER CONTROL

3924896 AIR CUSHION DREDGE FOR USE IN ICE-COVERED WATERS  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; ICE PROTECTION

3964184 METHOD OF REMOVING MATERIAL FROM A BED OF A BODY OF WATER  
OTHER KEYWORDS: DREDGE, SUCTION ; SEABED TRENCHER

3975784 MARINE STRUCTURE  
OTHER KEYWORDS: DREDGE, SUCTION ; OFFSHORE PLATFORM ANCHOR ;  
OFFSHORE PLATFORM, FLOATING ; POLLUTANT DISPERSION ;  
SEABED PIPELINE PLACEMENT ; SEABED TRENCHER

3983707 METHOD AND APPARATUS FOR MOVING AN OBJECT ON THE BOTTOM OF A BODY  
OF WATER. OTHER KEYWORDS: DREDGE, SUBMERGED

#### DREDGE-SPOIL TRANSPORT

3815267 METHOD AND APPARATUS FOR SUCKING UP MATERIAL FROM THE BOTTOM  
OF A BODY OF WATER. OTHER KEYWORDS: DREDGE, SUCTION ;  
DREDGE, SUBMERGED ; HOPPER BARGE

3820258 APPARATUS AND METHOD FOR DREDGING, RETENTION, TRANSPORT  
AND DISPOSAL OF DREDGE MATERIAL. OTHER KEYWORDS:  
DREDGE PIPE ; HOPPER BARGE

3841710 METHOD AND APPARATUS FOR MOVING SOLIDS FROM A REMOTE LOCATION

3874101 DREDGER WITH ADJUSTABLE ENDLESS DIGGER AND ROTARY MUD SLINGER  
OTHER KEYWORDS: DREDGE LADDER CONTROL ; DREDGE, MECHANICAL ;  
DREDGE PROPULSION

3878946 APPARATUS FOR LOADING A HOPPER OF A SUCTION DREDGER WITH SAND  
OTHER KEYWORDS: DREDGE, SUCTION ; HOPPER BARGE

3881530 PLANT FOR EVACUATING DREDGED MATERIAL  
OTHER KEYWORDS: HOPPER BARGE ; OFFSHORE MOORING STRUCTURE ; PUMP

3881840 CENTRIFUGAL PUMP FOR PROCESSING LIQUIDS CONTAINING ABRASIVE  
CONSTITUENTS, MORE PARTICULARLY, A SAND PUMP OR A WASTE-WATER PUMPER  
OTHER KEYWORDS: PUMP

3894401 SAND FILL COMPACTION SYSTEM  
OTHER KEYWORDS: SEABED MATERIAL PLACEMENT ; SEABED SOIL TREATMENT

3999566 METHOD AND APPARATUS FOR DISCHARGING OVERBOARD EXCESS WATER  
FROM HOPPER OF HOPPER SUCTION DREDGER OR BARGE OR SCOW  
OTHER KEYWORDS: DREDGE, SUCTION ; HOPPER BARGE ;  
POLLUTANT COLLECTION

#### DREDGE, CUTTERHEAD

3792538 ARTIFICIAL ISLAND FORMED OF HINGEDLY INTERCONNECTED PONTOONS  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP ; OFFSHORE PLATFORM, WALKING

3797139 FLOATING DREDGE MOTION COMPENSATOR  
OTHER KEYWORDS: DREDGE LADDER CONTROL

3807066 CUTTER HEAD FOR SUCTION DREDGE  
OTHER KEYWORDS: DREDGE INTAKE

3808716 DREDGE CUTTERHEAD  
OTHER KEYWORDS: DREDGE INTAKE

3821859 DREDGE LADDER SHOCK MOUNTING ARRANGEMENTS  
OTHER KEYWORDS: DREDGE LADDER CONTROL

3823495 ROTATABLY DRIVEN CUTTER FOR A SUCTION DREDGER  
OTHER KEYWORDS: DREDGE INTAKE

3857651 PUMPING UNITS FOR CYCLONIC ELEVATOR  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE INTAKE ; PUMP

3867772 METHOD OF EXCAVATING TO FORM OR ENLARGE A WATERWAY  
OTHER KEYWORDS: DREDGE LADDER CONTROL ; WATER PLANT REMOVAL

3877159 ROTARY DISK CUTTER FOR A CUTTER DREDGE  
OTHER KEYWORDS: DREDGE INTAKE

3885330 EXCAVATOR FOR DIGGING A HOLE BENEATH THE WATER  
OTHER KEYWORDS: DREDGE INTAKE

3896566 SUBMARINE DIGGING WHEEL WHICH DISCHARGES MATERIAL IN AN AIR CHAMBER  
OTHER KEYWORDS: DREDGE INTAKE

3902448 DREDGE HAVING IMPROVED PROPELLING MEANS  
OTHER KEYWORDS: DREDGE PROPULSION

3909960 LOOSE MATERIAL RECOVERY SYSTEM HAVING A MIXING BOX  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE INTAKE

3919790 PUSHED SUCTION DREDGE AND PARGE COMBINATION  
OTHER KEYWORDS: DREDGE INTAKE ; DREDGE PROPULSION ; PUMP

3919791 DREDGER HAVING SEPARATELY FLOATING DREDGE AND TAIL SECTIONS  
AND METHOD OF DREDGING. OTHER KEYWORDS: DREDGE LADDER CONTROL ;  
DREDGE PROPULSION

3924896 AIR CUSHION DREDGE FOR USE IN ICE-COVERED WATERS  
OTHER KEYWORDS: DREDGE PROPULSION ; ICE PROTECTION

3945761 PAN DISTURBING SAND AT THE BOTTOM OF A BODY OF WATER  
SO THAT IT MAY BE PUMPED UP EFFICIENTLY. OTHER KEYWORDS:  
DREDGE INTAKE

3956834 DREDGE LADDER SHOCK MOUNTING ARRANGEMENTS  
OTHER KEYWORDS: DREDGE LADDER CONTROL

3962803 DREDGING HEAD  
OTHER KEYWORDS: DREDGE INTAKE ; PUMP ; WATER PLANT REMOVAL

3971148 DREDGE CUTTERHEAD  
OTHER KEYWORDS: DREDGE INTAKE ; WATER PLANT REMOVAL

3978679 METHOD AND APPARATUS FOR UNDERWATER TRENCH EXCAVATION  
AND PIPELINE LAYING. OTHER KEYWORDS: DREDGE, SUBMERGED ;  
SEABED PIPELINE PLACEMENT ; SEABED TRENCHER

#### DREDGE, MECHANICAL

3864851 DREDGE CHAIN, SPROCKET, AND COMBINATION

3869814 EXCAVATOR WITH DRAGLINE EQUIPMENT

3874101 DREDGER WITH ADJUSTABLE ENDLESS DIGGER AND ROTARY MUD SLINGER  
OTHER KEYWORDS: DREDGE LADDER CONTROL ; DREDGE PROPULSION ;  
DREDGE-SPOIL TRANSPORT

3889403 METHOD AND APPARATUS FOR CONTINUOUS UNDERWATER MINING  
USING PLURAL SHIPS

3896567 DREDGING BUCKET HAVING A REINFORCED EDGE

3908291 APPARATUS FOR PREVENTING TANGLE OF ENDLESS ROPE IN MINING  
OR SEA LIFE GATHERING  
OTHER KEYWORDS: DREDGE LADDER CONTROL

3920137 EXCAVATING MACHINE WITH CLAMSHELL BUCKET  
OTHER KEYWORDS: DREDGE LADDER CONTROL



- 3943644 MINING DREDGE HAVING ENDLESS BUCKET CONVEYOR AND FLEXIBLE GUIDE TRAIN
- 3945137 BRAKE FOR CUSHIONING PENDULUM MOVEMENTS, ESPECIALLY FOR GRAB BUCKETS OF HYDRAULICALLY OPERABLE EARTH DREDGES
- 3947980 PROCESS AND APPARATUS FOR DEEP-SEA PARTICLE HARVESTING
- 3949497 RELEASABLE LATCHING APPARATUS FOR A BENTHIC GRAB  
OTHER KEYWORDS: SAMPLER, SEABED GRAB
- 3949498 GRAB BUCKET FOR DREDGING SLUDGE
- 3955294 ELEVATOR APPARATUS FOR TOWED DEEP-SEA PARTICLE HARVESTER
- 3968579 APPARATUS FOR SEDIMENT DREDGING AND OCEAN MINERAL GATHERING
- 3999313 TOWED SLED FOR DEEP-SEA PARTICLE HARVEST  
OTHER KEYWORDS: DREDGE INTAKE

#### DREDGE, SUBMERGED

- 3783626 STRUCTURE, AND METHOD AND APPARATUS FOR FOUNDING A STRUCTURE  
OTHER KEYWORDS: DREDGE, SUCTION ; OFFSHORE CONSTRUCTION ;  
SEABED FOUNDATION
- 3815267 METHOD AND APPARATUS FOR SUCKING UP MATERIAL FROM THE BOTTOM  
OF A BODY OF WATER. OTHER KEYWORDS: DREDGE, SUCTION ;  
DREDGE-SPOIL TRANSPORT ; HOPPER BARGE
- 3897639 VEHICLE FOR UNDERWATER EXCAVATION BENEATH A STRUCTURE  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE PROPULSION ;  
OFFSHORE CONSTRUCTION ; SEABED FOUNDATION
- 3905137 UNDERWATER TRACTOR AND IMPLEMENT THEREFOR  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE INTAKE
- 3978679 METHOD AND APPARATUS FOR UNDERWATER TRENCH EXCAVATION  
AND PIPELINE LAYING. OTHER KEYWORDS: DREDGE, CUTTERHEAD ;  
SEABED PIPELINE PLACEMENT ; SEABED TRENCHER
- 3983707 METHOD AND APPARATUS FOR MOVING AN OBJECT ON THE BOTTOM  
OF A BODY OF WATER. OTHER KEYWORDS: DREDGE PROPULSION

#### DREDGE, SUCTION

- 3783626 STRUCTURE, AND METHOD AND APPARATUS FOR FOUNDING A STRUCTURE  
OTHER KEYWORDS: DREDGE, SUBMERGED ; OFFSHORE CONSTRUCTION ;  
SEABED FOUNDATION
- 3787144 EXPLOSIVE PUMPING AND DREDGING METHOD AND APPARATUS  
OTHER KEYWORDS: DREDGE INTAKE ; PUMP ; SEABED TRENCHER
- 3791763 PUMP USED IN DREDGING SYSTEMS OPERATING WITH COMPRESSED AIR  
OTHER KEYWORDS: DREDGE INTAKE ; PUMP
- 3803856 PROCESS AND APPARATUS FOR ACHIEVING THE MECHANICAL TRENCHING  
OF A PIPE-LINE IN A SUB-AQUEOUS DEPTH. OTHER KEYWORDS:  
DREDGE INTAKE ; PUMP ; SEABED PIPELINE PLACEMENT ; SEABED TRENCHER
- 3815267 METHOD AND APPARATUS FOR SUCKING UP MATERIAL FROM THE BOTTOM  
OF A BODY OF WATER. OTHER KEYWORDS: DREDGE, SUBMERGED ;  
DREDGE-SPOIL TRANSPORT ; HOPPER BARGE
- 3828451 DUCTING SYSTEM FOR SUCTION DREDGERS HAVING PIVOTALLY CONNECTED  
TUBE LENGTHS. OTHER KEYWORDS: DREDGE PIPE

3842521 SUBMERSIBLE DREDGING PUMP AND SHOVEL ARRANGEMENT WITH SUSPENSION  
AND TOWING MEANS THEREFOR. OTHER KEYWORDS: DREDGE INTAKE ; PUMP

3842522 METHOD FOR HYDRAULICALLY RAISING ORE AND OTHER MATERIALS  
OTHER KEYWORDS: PUMP

3857651 PUMPING UNITS FOR CYCLONIC ELEVATOR  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; DREDGE INTAKE ; PUMP

3878946 APPARATUS FOR LOADING A HOPPER OF A SUCTION DREDGER WITH SAND  
OTHER KEYWORDS: DREDGE-SPOIL TRANSPORT ; HOPPER BARGE

3885331 DREDGING BARGE HAVING DIGGING JETS AND STEERING JETS  
OTHER KEYWORDS: DREDGE PROPULSION ; SEALED TRENCHER

3893249 SUCTION DREDGING WITH SWELL COMPENSATION  
OTHER KEYWORDS: DREDGE LADDER CONTROL

3897639 VEHICLE FOR UNDERWATER EXCAVATION BENEATH A STRUCTURE  
OTHER KEYWORDS: DREDGE PROPULSION ; DREDGE, SUBMERGED ;  
OFFSHORE CONSTRUCTION ; SEALED FOUNDATION

3905137 UNDERWATER TRACTOR AND IMPLEMENT THEREFOR  
OTHER KEYWORDS: DREDGE INTAKE ; DREDGE, SUBMERGED

3908290 HYDRAULIC DREDGING SYSTEM AND METHOD FOR COLLECTING  
AND REMOVING MATERIAL FROM DEEP SEA BEDS  
OTHER KEYWORDS: DREDGE LADDER CONTROL

3909960 LOOSE MATERIAL RECOVERY SYSTEM HAVING A MIXING BOX  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; DREDGE INTAKE

3949496 WAVE COMPENSATING SYSTEM FOR SUCTION DREDGERS  
OTHER KEYWORDS: DREDGE LADDER CONTROL

3950030 UNDERWATER MINING  
OTHER KEYWORDS: DREDGE INTAKE

3958346 MULTIPLE PUMPING CHAMBER DREDGING APPARATUS  
OTHER KEYWORDS: DREDGE INTAKE ; PUMP ; SAMPLER, SEALED GRAB

3964184 METHOD OF REMOVING MATERIAL FROM A BED OF A BODY OF WATER  
OTHER KEYWORDS: DREDGE PROPULSION ; SEALED TRENCHER

3967393 UNDERWATER SOLIDS COLLECTING APPARATUS  
OTHER KEYWORDS: OFFSHORE PLATFORM ANCHOR

3969834 AIRLIFT  
OTHER KEYWORDS: PUMP

3971513 DREDGE PUMP  
OTHER KEYWORDS: PUMP

3972137 DREDGING INSTALLATION  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED

3975784 MARINE STRUCTURE  
OTHER KEYWORDS: DREDGE PROPULSION ; OFFSHORE PLATFORM ANCHOR ;  
OFFSHORE PLATFORM, FLOATING ; POLLUTANT DISPERSION ;  
SEALED PIPELINE PLACEMENT ; SEALED TRENCHER

3975842 METHOD AND APPARATUS FOR DREDGING EMPLOYING A TRANSPORT FLUID  
FLOWING IN SUBSTANTIALLY CLOSED RECIRCULATING COURSE

3988843 MINING TRANSITION CHAMBER  
OTHER KEYWORDS: DREDGE INTAKE

- 3990379 DREDGING APPARATUS  
OTHER KEYWORDS: DREDGE PIPE
- 3994082 AIR OPERATED DREDGING APPARATUS  
OTHER KEYWORDS: DREDGE INTAKE ; PUMP
- 3999566 METHOD AND APPARATUS FOR DISCHARGING OVERBOARD EXCESS WATER  
FROM HOPPER OF HOPPER SUCTION DREDGER OR BARGE OR SCOW  
OTHER KEYWORDS: DREDGE-SPOIL TRANSPORT ; HOPPER BARGE ;  
POLLUTANT COLLECTION

#### DUNE PROTECTION

- 3913333 MEANS AND APPARATUS FOR CONTROLLING FLUID CURRENTS  
AND SELECTIVELY PRESERVING AND MODIFYING  
TOPOGRAPHY SUBJECTED THERETO. OTHER KEYWORDS: BREAKWATER, CONCRETE ;  
CHANNEL PROTECTION ; SAND FENCE ; SEAWALL ; TIDAL INLET

#### ELECTRICAL GENERATOR

- 3783302 APPARATUS AND METHOD FOR CONVERTING WAVE ENERGY  
INTO ELECTRICAL ENERGY. OTHER KEYWORDS: POWER, WAVE
- 3805515 MODULARIZED SEA POWER ELECTRICAL GENERATOR PLANT  
OTHER KEYWORDS: POWER, SUBMERGED SOURCE
- 3808445 WAVE OPERATED POWER PLANT  
OTHER KEYWORDS: POWER, SUBMERGED SOURCE ; POWER, WAVE
- 3828557 ELECTRIC GENERATING APPARATUS CONVERTING THE PUSHING ACTION  
OF WAVES INTO ELECTRICAL POWER OTHER KEYWORDS: POWER, WAVE
- 3870893 WAVE OPERATED POWER PLANT  
OTHER KEYWORDS: POWER, WAVE
- 3879950 SPECIAL POWER GENERATING UNIT USING COMPRESSED AIR PRODUCED  
BY OCEAN WAVE TOGETHER WITH SUPER-HEATED STEAM  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; POWER, WAVE ; PUMP
- 3882320 TIDE ENERGY CONVERSION DEVICE  
OTHER KEYWORDS: POWER, TIDE ; TIDAL INLET
- 3896622 MOBILE POWER GENERATION DEVICE EMPLOYING TROPICAL WATER THERMOCLINE  
OTHER KEYWORDS: POWER, SUBMERGED SOURCE
- 3898471 ELECTRIC GENERATOR RESPONSIVE TO WAVES IN BODIES OF WATER  
OTHER KEYWORDS: POWER, WAVE
- 3912938 ELECTRICAL STATIONS OPERATED BY WAVES  
OTHER KEYWORDS: OFFSHORE PLATFORM, FLOATING ; POWER, WAVE
- 3922739 APPARATUS FOR CONVERTING SEA WAVE ENERGY INTO ELECTRICAL ENERGY  
OTHER KEYWORDS: BUOY, INSTRUMENTED ; INSTRUMENT POWER SUPPLY ;  
POWER, WAVE
- 3927330 WATER POWER MACHINE AND UNDER SEA, UNDER WATER GENERATOR STATION  
OTHER KEYWORDS: POWER, SUBMERGED SOURCE ; POWER, TIDE ;  
SEABED FOUNDATION
- 3928967 APPARATUS AND METHOD FOR EXTRACTING WAVE ENERGY  
OTHER KEYWORDS: POWER, WAVE ; PUMP
- 3959663 TIDE-POWERED ELECTRICAL GENERATOR  
OTHER KEYWORDS: POWER, TIDE

3962377 OFF-SHORE POWER PLANT  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED

3965364 WAVE GENERATOR  
OTHER KEYWORDS: POWER, WAVE

3965365 POWER GENERATING MACHINE ACTUATED BY OCEAN SWELLS  
OTHER KEYWORDS: POWER, WAVE

3970415 ONE WAY VALVE PRESSURE PUMP TURBINE GENERATOR STATION  
OTHER KEYWORDS: POWER, WAVE ; PUMP

3983404 SURF-TURBINE GENERATING SYSTEM  
OTHER KEYWORDS: POWER, WAVE

3988592 ELECTRICAL GENERATING SYSTEM  
OTHER KEYWORDS: POWER, TIDE ; POWER, WAVE ; PUMP

3989951 WAVE ENERGY POWER GENERATING BREAKWATER  
OTHER KEYWORDS: POWER, WAVE ; PUMP

3991563 HYDROELECTRIC POWER PLANT  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED

3993913 TIDEWATER POWER SYSTEM  
OTHER KEYWORDS: CHANNEL BARRIIR ; POWER, TIDE ;  
TIDAL ESTUARY WATER LEVEL

3994134 APPARATUS FOR POWER GENERATION IN DEEP SEAWATER  
OTHER KEYWORDS: POWER, SUBMERGED SOURCE

3995160 METHOD AND APPARATUS FOR OBTAINING ELECTRICAL POWER FROM SEA WATER  
OTHER KEYWORDS: OFFSHORE PLATFORM, FLOATING ; POWER, SUBMERGED SOURCE

#### EMBEDMENT ANCHOR

3797255 UNDER-WATER ANCHOR APPARATUS AND METHODS OF INSTALLATION

3797260 PIPELINE ANCHORING SYSTEM  
OTHER KEYWORDS: SEABED PIPELINE PLACEMENT

3824794 OFFSHORE MARINE ANCHORING STRUCTURE  
OTHER KEYWORDS: OFFSHORE PLATFORM ANCHOR ; OFFSHORE PLATFORM, LEG

3839984 SAFE AND ARM MECHANISM FOR AN EMBEDMENT ANCHOR PROPELLANT

3841105 METHOD AND APPARATUS FOR ANCHORING UNDERWATER PIPELINES  
OTHER KEYWORDS: SEABED PIPELINE PLACEMENT

3841106 PIPELINE ANCHORING SYSTEMS  
OTHER KEYWORDS: SEABED PIPELINE PLACEMENT

3850128 VIBRATORY ANCHOR

3851492 APPARATUS AND METHOD FOR OFFSHORE OPERATIONS  
OTHER KEYWORDS: SEABED PIPELINE PLACEMENT ; SEABED TRENCHER

3874181 HIGH LOAD CARRYING CAPACITY, FREEZE AND CRACK-PROOF  
CONCRETE METAL PILE. OTHER KEYWORDS: ICE PROTECTION ;  
PILE, CONCRETE ; PILE, STEEL

3891037 REMOTELY OPERATED SEAFLOOR CORING AND DRILLING METHOD AND SYSTEM  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ; PILE PLACEMENT ;  
SAMPLER, SEABED-DRILLED CORE

3908386 ROCK BOLT FOR REMOTE INSTALLATION

- 3910218 PROPELLANT-ACTUATED DEEP WATER ANCHOR
- 3984991 ANCHOR AND METHOD OF SETTING ANCHOR  
OTHER KEYWORDS: OFFSHORE PLATFORM ANCHOR
- 3995438 METHOD FOR INCREASING THE LOAD CARRYING CAPACITY  
AND PULL-OUT RESISTANCE OF HOLLOW PILES.OTHER KEYWORDS:  
PILE, CONCRETE ; PILE, SHEET

FABRIC MAT

- 3785158 HYDRAULIC ENGINEERING INSTALLATIONS  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM ANCHOR ;  
OFFSHORE STORAGE TANK, EMERGENT ; SEABED FOUNDATION ;  
SEABED SOIL TREATMENT
- 3786640 MEANS AND METHOD FOR PRODUCING STEPPED CONCRETE SLOPE STRUCTURES  
OTHER KEYWORDS: CONCRETE FORM ; LOW-COST SHORE PROTECTION ;  
REVEEMENT ; SANDBAG ; SLOPE PROTECTION
- 3793845 APPARATUS AND METHOD FOR ANCHORING SUBMERGED CONDUIT  
OTHER KEYWORDS: SEABED MATERIAL PLACEMENT ;  
SEABED PIPELINE PLACEMENT ; SEABED SCOUR PROTECTION
- 3811287 BOTTOM AND BANK FACING  
OTHER KEYWORDS: SEABED SCOUR PROTECTION ; SLOPE PROTECTION
- 3830066 APPARATUS AND SYSTEM FOR PRODUCING AND PROTECTING DEPOSITS  
OF SEDIMENTARY MATERIAL ON FLOORS OF BODIES OF WATER  
OTHER KEYWORDS: BAR PROTECTION
- 3837169 REINFORCED MATTRESS FOR PROTECTING SHOPELINES AND THE LIKE  
OTHER KEYWORDS: CONCRETE FORM ; REVEEMENT
- 3844123 DEVICE FOR PRODUCING AND PROTECTING DEPOSITS OF SEDIMENTARY MATERIAL  
ON THE FLOOR OF BODIES OF WATER.OTHER KEYWORDS: BAR PROTECTION ;  
SEABED SCOUR PROTECTION
- 3871182 METHOD OF PROTECTION FOR SLOPES AND CRESTS OF RIVERS; CHANNELS;  
AND THE LIKE.OTHER KEYWORDS: CONCRETE FORM ; REVEEMENT ;  
SEABED MATERIAL PLACEMENT ; SLOPE PROTECTION
- 3874177 POCKET MAT  
OTHER KEYWORDS: SLOPE PROTECTION
- 3893304 METHOD AND A DEVICE FOR THE UNDERWATER CONSTRUCTION  
OF CONCRETE STRUCTURES.OTHER KEYWORDS: CONCRETE FORM ;  
OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FIXED ; SEABED MATERIAL  
PLACEMENT
- 3906734 FIXED MARINE PLATFORM WITH DISPERSED BASE  
OTHER KEYWORDS: CONCRETE FORM ; OFFSHORE PLATFORM, FIXED ;  
SEABED FOUNDATION ; SEABED SCOUR PROTECTION
- 3922865 MATTRESS, METHOD OF SINKING A MATTRESS AND VESSEL SUITABLE  
FOR USE IN SAID METHOD.OTHER KEYWORDS: CONCRETE BLOCK ;  
SEABED MATERIAL PLACEMENT ; SLOPE PROTECTION
- 3928978 APPARATUS FOR PRODUCING AND PROTECTING DEPOSITS  
OF SEDIMENTARY MATERIAL ON FLOORS OF BODIES OF WATER  
OTHER KEYWORDS: BAR PROTECTION ; SEABED SCOUR PROTECTION
- 3938339 MEANS FOR SLOWING AND/OR DETOURING WATER CURRENTS  
AND THE PREPARATION THEREOF.OTHER KEYWORDS: GROIN ; JETTY ;  
OFFSHORE CONSTRUCTION ; SEABED FOUNDATION

3955372 METHOD OF INSTALLING A FIXED MARINE PLATFORM WITH DISPERSED BASE  
OTHER KEYWORDS: CONCRETE FORM ; OFFSHORE PLATFORM, FIXED ;  
SEABED FOUNDATION ; SEABED MATERIAL PLACEMENT ;  
SEABED SCOUR PROTECTION

3962083 APPARATUS AND METHOD FOR PROTECTING A SHOPELINE  
AGAINST CONTAMINATION FROM AN OIL SPILL. OTHER KEYWORDS:  
POLLUTANT ABSORPTION ; POLLUTANT, MECHANICAL REMOVAL ;  
WAVE ABSORBER BEACH

3983705 APPARATUS FOR FORMING A BOTTOM PROTECTION  
OTHER KEYWORDS: SEABED SCOUR PROTECTION

3984989 MEANS FOR PRODUCING SUBAQUEOUS AND OTHER CAST-IN-PLACE CONCRETE  
STRUCTURES IN SITU. OTHER KEYWORDS: BREAKWATER, CONCRETE ;  
CONCRETE FORM ; OFFSHORE CONSTRUCTION ; PILE, CONCRETE ;  
SEAWALL ; STRUCTURE REPAIR

#### FOULING PREVENTION

3824852 ELECTRICALLY POWERED SUBMERGED PUMP; POWER CIRCUIT THEREFOR;  
AND OCEANOGRAPHIC MONITORING APPARATUS AND METHOD EMPLOYING SAME  
OTHER KEYWORDS: PUMP ; SAMPLER, WATER

3861949 ARTICLE HAVING APPLIED TO THE SURFACE THEREOF; AN ANTI-FOULING  
COMPOSITION COMPRISING A POLYMER AND AN ORGANO-TIN COMPOUND  
OTHER KEYWORDS: COATING

3867630 SENSOR FOR SUBMERSIBLE PROBES  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT

3870009 PROTECTIVE COVERING APPARATUS FOR A SUBMERGED STRUCTURE  
OTHER KEYWORDS: CORROSION PREVENTION

3896753 HYDROPHILIC POLYMER COATING FOR UNDERWATER STRUCTURES  
OTHER KEYWORDS: COATING

3999399 PROTECTIVE GUARD MEANS FOR WOOD PILING AND A METHOD  
OF INSTALLING SAME UNDER DRY WORKING CONDITIONS. OTHER KEYWORDS:  
COATING ; COLLISION PROTECTION ; PIER FENDER ; PILE PROTECTION ;  
PILE, WOOD

#### FOULING REMOVAL

3800732 BOAT HULL CLEANING APPARATUS  
OTHER KEYWORDS: SMALL-CRAFT SERVICE STRUCTURE

#### GROIN

3820343 SELF-SUPPORTING WALL  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; LOW-COST SHORE PROTECTION ;  
SEAWALL

3835651 LITTORAL FLOW TRAP OR BASIN  
OTHER KEYWORDS: BREAKWATER, STEEL FRAME ; BULKHEAD ; SEAWALL

3927533 UNDERWATER WALL STRUCTURE  
OTHER KEYWORDS: BAR PROTECTION ; BREAKWATER, CONCRETE ;  
PILE, CONCRETE ; PILE, SHEET

3938339 MEANS FOR SLOWING AND/OR DETOURING WATER CURRENTS  
AND THE PREPARATION THEREOF. OTHER KEYWORDS: FABRIC MAT ; JETTY ;  
OFFSHORE CONSTRUCTION , SEABED FOUNDATION

3953976 SELF-SUPPORTING WALL  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; LOW-COST SHORE PROTECTION ;  
SEAWALL

#### GROUTING

3811289 METHODS OF GROUTING OFFSHORE STRUCTURES  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE, STRUCTURE CONNECTION

3832857 PRESSURE GROUTING  
OTHER KEYWORDS: PILE, STRUCTURE CONNECTION ; SEABED FOUNDATION

3838575 METHOD OF GROUTING OFFSHORE STRUCTURE  
OTHER KEYWORDS: PILE, STRUCTURE CONNECTION

3839872 METHOD OF SECURING A LARGE-DIAMETER TUBE TO A CASING UNDERWATER  
OTHER KEYWORDS: PILE, STRUCTURE CONNECTION

3852971 PILE STRUCTURE  
OTHER KEYWORDS: PILE-DRIVING SHOE ; PILE, STEEL

3878687 GROUTING OF OFFSHORE STRUCTURES  
OTHER KEYWORDS: OFFSHORE PLATFORM, LEG ; PILE, STRUCTURE CONNECTION

3938342 METHOD AND A DEVICE FOR BUILDING IMMERSED FOUNDATIONS  
OTHER KEYWORDS: CONCRETE FORM ; OFFSHORE CONSTRUCTION ;  
SEABED FOUNDATION ; SEABED MATERIAL PLACEMENT

3939664 LARGE DIAMETER TUBULAR PILES AND THE BEDDING THEREOF  
OTHER KEYWORDS: PILE FOOTING ; PILE, STEEL ; SEABED FOUNDATION

3967456 SEALING DEVICES  
OTHER KEYWORDS: PILE, STRUCTURE CONNECTION

3987636 METHODS AND APPARATUS FOR ANCHORING A SUBMERGED STRUCTURE  
TO A WATERBED. OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ;  
OFFSHORE PLATFORM, LEG ; PILE FOOTING ; PILE, STRUCTURE CONNECTION ;  
SEABED FOUNDATION

RE28232 METHODS OF GROUTING OFFSHORE STRUCTURES  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE, STRUCTURE CONNECTION

#### HOPPER BARGE

3815267 METHOD AND APPARATUS FOR SUCKING UP MATERIAL FROM THE BOTTOM  
OF A BODY OF WATER. OTHER KEYWORDS: DREDGE, SUCTION ;  
DREDGE, SUBMERGED ; DREDGE-SPOIL TRANSPORT

3820258 APPARATUS AND METHOD FOR DREDGING, RETENTION, TRANSPORT  
AND DISPOSAL OF DREDGE MATERIAL. OTHER KEYWORDS: DREDGE PIPE ;  
DREDGE-SPOIL TRANSPORT

3837312 HYDRAULIC CONTROL MECHANISM FOR HOPPER BARGES

3878946 APPARATUS FOR LOADING A HOPPER OF A SUCTION DREDGER WITH SAND  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE-SPOIL TRANSPORT

3881530 PLANT FOR EVACUATING DREDGED MATERIAL  
OTHER KEYWORDS: DREDGE-SPOIL TRANSPORT ; OFFSHORE MOORING STRUCTURE ;  
PUMP

3918381 BOTTOM-DUMP VESSELS

3946686 BOTTOM-DUMP VESSEL

3999566 METHOD AND APPARATUS FOR DISCHARGING OVERBOARD EXCESS WATER  
FROM HOPPER SUCTION DREDGER OR BARGE OR SCOW  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE-SPOIL TRANSPORT ;  
POLLUTANT COLLECTION

#### HYDRAULIC MODEL BASIN

3789612 METHOD OF SURF GENERATION  
OTHER KEYWORDS: WAVE GENERATOR

3827290 STREAM TABLE STUDY CENTER  
OTHER KEYWORDS: WAVE GENERATOR

3837094 WAVE GENERATING APPARATUS FOR STUDY OF WAVE PHENOMENA  
OTHER KEYWORDS: WAVE GENERATOR

#### ICE PROTECTION

3793840 MOBILE, ARCTIC DRILLING AND PRODUCTION PLATFORM  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE PLATFORM, JACK UP ;  
SEABED FOUNDATION

3798912 ARTIFICIAL ISLANDS AND METHOD OF CONTROLLING ICE MOVEMENT  
IN NATURAL OR MAN-MADE BODIES OF WATER. OTHER KEYWORDS:  
OFFSHORE ISLAND ; OFFSHORE STRUCTURE FENDER ; SEABED FOUNDATION ;  
ICE STRUCTURE

3807179 DEICING SYSTEMS  
OTHER KEYWORDS: OFFSHORE PLATFORM, LEG ; OFFSHORE STRUCTURE FENDER

3822558 ARCTIC DREDGING AND PIPELAYING  
OTHER KEYWORDS: DREDGE PROPULSION ; SEABED PIPELINE PLACEMENT ;  
SEABED TRENCHER

3831385 ARCTIC OFFSHORE PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; OFFSHORE PLATFORM, JACK UP ;  
OFFSHORE STRUCTURE FENDER

3874181 HIGH LOAD CARRYING CAPACITY, FREEZE AND CRACK-PROOF CONCRETE METAL PILE  
OTHER KEYWORDS: EMBEDMENT ANCHOR ; PILE, CONCRETE ; PILE, STEEL

3881318 ARCTIC BARRIER FORMATION  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE ISLAND ;  
OFFSHORE STRUCTURE FENDER ; ICE STRUCTURE

3894504 ICE CUTTER FOR MONOPOD DRILLING PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; OFFSHORE PLATFORM, LEG ;  
OFFSHORE STRUCTURE FENDER

3924896 AIR CUSHION DREDGE FOR USE IN ICE-COVERED WATERS  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; DREDGE PROPULSION

3952527 OFFSHORE PLATFORM FOR ARCTIC ENVIRONMENTS  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; OFFSHORE STRUCTURE FENDER ;  
ICE STRUCTURE

3972199 LOW ADHESIONAL ARCTIC OFFSHORE PLATFORM  
OTHER KEYWORDS: COATING ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE STRUCTURE FENDER

3977200 LIGHTHOUSE OR BEACON CONSTRUCTION  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED

RE28332 METHOD AND APPARATUS FOR PREVENTING ICE DAMAGE TO MARINE STRUCTURES  
OTHER KEYWORDS: OFFSHORE MOORING STRUCTURE ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE PLATFORM, LEG ; OFFSHORE STRUCTURE FENDER



#### ICE STRUCTURE

- 3798912 ARTIFICIAL ISLANDS AND METHOD OF CONTROLLING ICE MOVEMENT  
IN NATURAL OR MAN-MADE BODIES OF WATER.OTHER KEYWORDS:  
ICE PROTECTION ; OFFSHORE ISLAND ; OFFSHORE STRUCTURE FENDER ;  
SEABED FOUNDATION
- 3849993 METHOD FOR CONSTRUCTING SEA ICE ISLANDS IN COLD REGIONS  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE ISLAND
- 3863456 METHOD FOR CONSTRUCTING ICE ISLANDS IN COLD REGIONS  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE ISLAND
- 3881318 ARCTIC BARRIER FORMATION  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE CONSTRUCTION ;  
OFFSHORE ISLAND ; OFFSHORE STRUCTURE FENDER
- 3952527 OFFSHORE PLATFORM FOR ARCTIC ENVIRONMENTS  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE STRUCTURE FENDER
- 3990253 METHOD FOR CONSTRUCTING AN ICE PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; OFFSHORE PLATFORM, LEG

#### INSTRUMENT CABLE

- 3792421 UNDERWATER DATA TRANSMISSION SYSTEM  
OTHER KEYWORDS: INSTRUMENT RETRIEVAL
- 3795759 BUOYANT ELECTRICAL CABLE

#### INSTRUMENT DEPLOYMENT

- 3782319 APPARATUS FOR LAUNCHING; TOWING AND RECOVERING A SUBMERSIBLE BODY  
FROM A VESSEL.OTHER KEYWORDS: INSTRUMENT RETRIEVAL ;  
TOW WINCH CONTROL
- 3800272 ROTATING ACOUSTIC SCANNER SYSTEM FOR POSITIONING OBJECTS  
ON THE OCEAN FLOOR.OTHER KEYWORDS: OFFSHORE CONSTRUCTION ;  
SEABED SITE SURVEY ; SONAR, SIDE LOOKING
- 3800346 SELF DESCENDING AND SURFACING WATER DEVICE  
OTHER KEYWORDS: INSTRUMENT RETRIEVAL
- 3811325 APPARATUS FOR COLLECTING SURFACE PARTICLES ON BODY OF WATER  
OTHER KEYWORDS: POLLUTANT COLLECTION ; SAMPLER, SURFACE
- 3818524 DEEP-SEA SLACK WIRE MOORING SYSTEM  
OTHER KEYWORDS: BUOY MOORING SYSTEM
- 3834229 METHOD AND APPARATUS FOR MEASURING WATER CURRENTS  
OTHER KEYWORDS: CURRENT MEASUREMENT
- 3867630 SENSOR FOR SUBMERSIBLE PROBES  
OTHER KEYWORDS: FOULING PREVENTION
- 3872819 WAVE-ACTUATED HORIZONTAL ARRAY STRETCHER  
OTHER KEYWORDS: POWER, WAVE
- 3874462 DEVICE FOR TAKING CORE SAMPLES FROM OCEAN AND OTHER SUBMARINE FLOORS  
OTHER KEYWORDS: INSTRUMENT RETRIEVAL ; SAMPLER, SEABED-DRIVEN CORE
- 3890844 PERIPHYTON SAMPLER AND METHOD FOR SAMPLING  
OTHER KEYWORDS: SAMPLER, BIOTA

- 3891037 REMOTELY OPERATED SEAFLOOR CORING AND DRILLING METHOD AND SYSTEM  
OTHER KEYWORDS: EMBEDMENT ANCHOR ; PILE PLACEMENT ;  
SAMPLER, SEABED-DRILLED CORE
- 3906564 REMOTELY CONTROLLED UNDERWATER INSTRUMENT SYSTEM  
OTHER KEYWORDS: BUOY MOORING SYSTEM
- 3906790 APPARATUS FOR MEASURING FLUIDIC CURRENT  
OTHER KEYWORDS: BUOY MOORING SYSTEM ; CURRENT MEASUREMENT
- 3927562 ENVIRONMENTAL PROFILER  
OTHER KEYWORDS: BUOY MOORING SYSTEM ; INSTRUMENT RETRIEVAL
- 3931740 APPARATUS FOR COLLECTING SURFACE PARTICLE ON BODY OF WATER  
OTHER KEYWORDS: POLLUTANT COLLECTION ; SAMPLER, SURFACE
- 3940732 BUOYANT ELECTRODE AND SYSTEM FOR HIGH SPEED TOWING  
OTHER KEYWORDS: SEABED PROPERTY MEASUREMENT ; TOWING CABLE
- 3946831 ACOUSTIC TRANSMITTER  
OTHER KEYWORDS: SEISMIC ACOUSTIC TRANSMITTER ARRAY ;  
SEISMIC VIBRATORY ACOUSTIC TRANSMITTER
- 3952349 VARIABLE BUOYANCY DEVICE  
OTHER KEYWORDS: BUOY, INSTRUMENTED
- 3970156 WATER WEIGHTED CORER  
OTHER KEYWORDS: INSTRUMENT RETRIEVAL ; SAMPLER, SEABED-DRIVEN CORE
- 3971251 DYNAMICALLY BALANCED APPARATUS FOR WATER BORNE INSTRUMENTS  
OTHER KEYWORDS: BUOY MOORING SYSTEM ; CURRENT MEASUREMENT
- 3972231 METHOD FOR MEASURING VELOCITY AND DIRECTION OF CURRENTS  
IN A BODY OF WATER. OTHER KEYWORDS: CURRENT MEASUREMENT
- 3978813 PROPELLER-DRIVEN HYDROPHONE ARRAY TENSIONING DEVICE  
OTHER KEYWORDS: SEISMIC HYDROPHONE ARRAY ; TOWED BODY DEPTH CONTROL
- 3991623 MARINE INSTRUMENT  
OTHER KEYWORDS: SALINITY MEASUREMENT
- 3992737 SUSPENSION SYSTEM FOR UNDERWATER EQUIPMENT  
OTHER KEYWORDS: BUOY, INSTRUMENTED
- 3996794 DIFFERENTIAL DEPTH INDICATOR  
OTHER KEYWORDS: DEPTH PRESSURE MEASUREMENT ;  
SEABED PIPELINE PLACEMENT ; SEABED SITE SURVEY

#### INSTRUMENT POWER SUPPLY

- 3922739 APPARATUS FOR CONVERTING SEA WAVE ENERGY INTO ELECTRICAL ENERGY  
OTHER KEYWORDS: BUOY, INSTRUMENTED ; ELECTRICAL GENERATOR ;  
POWER, WAVE

#### INSTRUMENT RETRIEVAL

- 3782319 APPARATUS FOR LAUNCHING, TOWING AND RECOVERING A SUBMERSIBLE BODY  
FROM A VESSEL. OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ;  
TOW WINCH CONTROL
- 3792421 UNDERWATER DATA TRANSMISSION SYSTEM  
OTHER KEYWORDS: INSTRUMENT CABLE
- 3800346 SELF DESCENDING AND SURFACING WATER DEVICE  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT

3805898 FOLDING BOTTOM CORE SAMPLER  
OTHER KEYWORDS: SAMPLER, SEABED-DRIVEN CORE

3820391 DEEP SEA PRESSURE GAUGE  
OTHER KEYWORDS: BATHY THERMOGRAPH ; DEPTH PRESSURE MEASUREMENT

3848226 HIGH CAPACITY UNDERWATER ACOUSTIC RELEASE  
OTHER KEYWORDS: BUOY MOORING SYSTEM

3848682 FREE-FALL CORER  
OTHER KEYWORDS: SAMPLER, SEABED-DRIVEN CORE

3874462 DEVICE FOR TAKING CORE SAMPLES FROM OCEAN AND OTHER SUBMARINE FLOORS  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ; SAMPLER, SEABED-DRIVEN CORE

3898609 UNDERWATER EXPLORATION DEVICE

3926137 DEEP OCEAN PARACHUTE RELEASE  
OTHER KEYWORDS: SEISMIC STREAMER CABLE

3927562 ENVIRONMENTAL PROFILER  
OTHER KEYWORDS: BUOY MOORING SYSTEM ; INSTRUMENT DEPLOYMENT

3970156 WATER WEIGHTED CORER  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ; SAMPLER, SEABED-DRIVEN CORE

3996678 FREE-FALL GRAB  
OTHER KEYWORDS: SAMPLER, SEABED GRAB

#### INSTRUMENT, AIRBORNE

3783284 METHOD AND APPARATUS FOR DETECTION OF PETROLEUM PRODUCTS  
OTHER KEYWORDS: INSTRUMENT, LASER ; POLLUTANT MEASUREMENT

3869913 METHOD AND APPARATUS FOR DETERMINING SURFACE WIND VELOCITY  
OTHER KEYWORDS: WIND MEASUREMENT

3899213 AIRBORNE LASER REMOTE SENSING SYSTEM FOR THE DETECTION  
AND IDENTIFICATION OF OIL SPILLS. OTHER KEYWORDS: INSTRUMENT, LASER ;  
POLLUTANT MEASUREMENT

3992105 METHOD AND APPARATUS FOR REMOTE SALINITY SENSING  
OTHER KEYWORDS: SALINITY MEASUREMENT

#### INSTRUMENT, LASER

3783284 METHOD AND APPARATUS FOR DETECTION OF PETROLEUM PRODUCTS  
OTHER KEYWORDS: INSTRUMENT, AIRBORNE ; POLLUTANT MEASUREMENT

3890840 LASER CONTROLLED FATHOMETER  
OTHER KEYWORDS: SONAR, DEPTH SOUNDER

3899213 AIRBORNE LASER REMOTE SENSING SYSTEM FOR THE DETECTION  
AND IDENTIFICATION OF OIL SPILLS. OTHER KEYWORDS:  
INSTRUMENT, AIRBORNE ; POLLUTANT MEASUREMENT

#### INSTRUMENT, RADIOISOTOPE

3891845 WET ENVIRONMENT RADIOGRAPHY APPARATUS  
OTHER KEYWORDS: PIPE, STEEL ; STRUCTURE INSPECTION

#### INSTRUMENT, SEABED IN SITU

3875796 APPARATUS FOR CONTINUOUSLY RECORDING SEA-FLOOR SEDIMENT  
CORER OPERATIONS. OTHER KEYWORDS: SAMPLER, SEABED-DRIVEN CORE ;  
SEABED PROPERTY MEASUREMENT

- 3901075 ACOUSTIC VELOCIMETER FOR OCEAN BOTTOM CORING APPARATUS  
OTHER KEYWORDS: SAMPLER, SEABED-DRIVEN CORE ;  
SEABED PROPERTY MEASUREMENT
- 3940982 SUBBOTTOM ROCK MAPPING PROBE  
OTHER KEYWORDS: SEDIMENTATION MEASUREMENT
- 3964424 INFLUENCE DETECTING GEAR WITH IMPROVED TOWING CHARACTERISTICS  
OTHER KEYWORDS: INSTRUMENT, TOWED ; SEABED PROPERTY MEASUREMENT ;  
TOWING CABLE

#### INSTRUMENT, TOWED

- 3841156 COMBINED DEPTH INDICATOR AND WATER SAMPLER  
OTHER KEYWORDS: DEPTH PRESSURE MEASUREMENT ; SAMPLER, WATER ;  
TOWED VEHICLE
- 3964424 INFLUENCE DETECTING GEAR WITH IMPROVED TOWING CHARACTERISTICS  
OTHER KEYWORDS: INSTRUMENT, SEABED IN SITU ;  
SEABED PROPERTY MEASUREMENT ; TOWING CABLE

#### JETTY

- 3938339 MEANS FOR SLOWING AND/OR DETOURING WATER CURRENTS  
AND THE PREPARATION THEREOF. OTHER KEYWORDS: FABRIC MAT ; GROIN ;  
OFFSHORE CONSTRUCTION ; SEABED FOUNDATION

#### LOW-COST SHORE PROTECTION

- 3786640 MEANS AND METHOD FOR PRODUCING STEPPED CONCRETE SLOPE STRUCTURES  
OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ; REVETMENT ; SANDBAG ;  
SLOPE PROTECTION
- 3820343 SELF-SUPPORTING WALL  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; GROIN ; SEAWALL
- 3842606 BEACH-PROTECTORS  
OTHER KEYWORDS: BAR PROTECTION ; TIRES ; WAVE ABSORBER BEACH
- 3844124 CONTROL OF EROSION  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; CONCRETE ARMOR UNIT ;  
WAVE ABSORBER BEACH
- 3877233 FLOATING BREAKWATER SYSTEM  
OTHER KEYWORDS: BREAKWATER, FLOATING
- 3884042 FLOATING BREAKWATER  
OTHER KEYWORDS: BREAKWATER, FLOATING ; TIRES .
- 3886751 AQUATIC CONSTRUCTION MODULE AND METHOD OF FORMING THEREOF  
OTHER KEYWORDS: CONCRETE FORM ; SANDBAG
- 3894397 BEACH EROSION CONTROL STRUCTURE  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; CONCRETE BLOCK ; SEAWALL
- 3903702 REVETMENT STRUCTURE  
OTHER KEYWORDS: CONCRETE BLOCK ; REVETMENT ; SLOPE PROTECTION
- 3953976 SELF-SUPPORTING WALL  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; GROIN ; SEAWALL
- 3957098 EROSION CONTROL BAG  
OTHER KEYWORDS: SANDBAG ; SEABED MATERIAL PLACEMENT

OFFSHORE CAISSON

- 3793840 MOBILE, ARCTIC DRILLING AND PRODUCTION PLATFORM  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE PLATFORM, JACK UP ;  
SEABED FOUNDATION
- 3805534 SLIDE RESISTANT PLATFORM ANCHOR CONDUCTOR SILO  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM ANCHOR
- 3824795 PLATFORM STRUCTURE  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; SEABED FOUNDATION
- 3830068 SYSTEM FOR EARTH PENETRATION IN DEEP WATER AT ATMOSPHERIC PRESSURE  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED
- 3846988 SWELL DAMPER  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; SEAWALL
- 3849990 ANTI-HEAVE PROTECTIVE SYSTEM  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; SEAWALL
- 3879952 PRESSURE RESISTANT CAISSON  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; OFFSHORE PLATFORM, LEG ;  
SEABED FOUNDATION
- 3881549 PRODUCTION AND FLARE CAISSON SYSTEM  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FIXED ;  
SEABED FOUNDATION ; SEABED OIL, PROCESS STRUCTURE
- 3889476 SUBMERSIBLE CAISSONS AND THEIR APPLICATIONS  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; OFFSHORE CONSTRUCTION ;  
OFFSHORE STORAGE TANK, EMERGENT
- 3898847 FIXED PLATFORM FOR DEEP SEA DEPTHS ABLE TO HOUSE PLANTS;  
EQUIPMENTS STRUCTURES, MEN AND MEANS. OTHER KEYWORDS:  
OFFSHORE PLATFORM, FIXED ; SEABED FOUNDATION ; SEABED SCOUR PROTECTION
- 3906735 FOUNDATION METHOD FOR CAISSONS  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; SEABED FOUNDATION
- 3910058 CONSTRUCTION OF IMMERSED STRUCTURES  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; SEABED PIPELINE PLACEMENT ;  
SEABED WATER, PROCESS STRUCTURE
- 3911687 FOUNDATION METHOD FOR CAISSONS  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; SEABED FOUNDATION
- 3913335 OFFSHORE TERMINAL  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ;  
OFFSHORE STORAGE TANK, SUBMERGED ; SEABED FOUNDATION ;  
SEABED SCOUR PROTECTION
- 3914947 SUBAQUATIC STRUCTURE  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; SEABED FOUNDATION ;  
SEABED SCOUR PROTECTION
- 3916632 TELESCOPIC CAISSON WITH INTERMEDIATELY POSITIONED WELLHEAD  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; SEABED FOUNDATION
- 3938341 STORAGE DEVICE FOR LIQUIDS  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ;  
OFFSHORE STORAGE TANK-EMERGENT
- 3945212 ARRANGEMENT IN OR RELATING TO CAISSONS OR THE LIKE  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FIXED ;  
PILE PLACEMENT ; SEABED FOUNDATION

- 3958426 OFFSHORE HARBOR TANK AND INSTALLATION  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; OFFSHORE HARBOR ;  
OFFSHORE STORAGE TANK, EMERGENT
- 3961489 METHOD FOR PLACING A FLOATING STRUCTURE ON THE SEA BED  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; SEABED FOUNDATION
- 3962680 COLUMNS FOR PLATFORMS, PIERS, CAUSEWAYS AND THE LIKE, AND METHOD  
OF ERECTING SAME, OTHER KEYWORDS: OFFSHORE CONSTRUCTION ;  
OFFSHORE PLATFORM, LEG ; PILE DRIVER, WATER JET
- 3965687 APPARATUS FOR ANCHORING A STRUCTURE TO THE FLOOR OF A BODY OF WATER  
OTHER KEYWORDS: OFFSHORE PLATFORM ANCHOR ; PILE DRIVER, WATER JET
- 3969900 BREAKWATER CONSTRUCTION  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; OFFSHORE CONSTRUCTION ;  
SEABED FOUNDATION

OFFSHORE CONSTRUCTION

- 3782127 METHOD AND APPARATUS FOR DEPOSITING FOUNDATIONS UNDER  
SUBMERGED STRUCTURES, OTHER KEYWORDS: SEABED FOUNDATION ;  
SEABED MATERIAL PLACEMENT
- 3783626 STRUCTURE, AND METHOD AND APPARATUS FOR FOUNDING A STRUCTURE  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE, SUBMERGED ;  
SEABED FOUNDATION
- 3785158 HYDRAULIC ENGINEERING INSTALLATIONS  
OTHER KEYWORDS: FABRIC MAT ; OFFSHORE PLATFORM ANCHOR ;  
OFFSHORE STORAGE TANK, EMERGENT ; SEABED  
FOUNDATION ; SEABED SOIL TREATMENT
- 3791153 METHOD FOR PLACING HYDRAULIC CONCRETE  
OTHER KEYWORDS: CONCRETE FORM ; SEABED MATERIAL PLACEMENT
- 3800272 ROTATING ACOUSTIC SCANNER SYSTEM FOR POSITIONING OBJECTS  
ON THE OCEAN FLOOR, OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ;  
SEABED SITE SURVEY ; SONAR, SIDE LOOKING
- 3800548 WATER HAMMER PILE DRIVING WITH CONDENSABLE VAPOR RESET  
OTHER KEYWORDS: PILE DRIVER, IMPACT
- 3803852 PROCESS FOR BUILDING AN ISLAND  
OTHER KEYWORDS: ARTIFICIAL SEAWEED ; OFFSHORE ISLAND ;  
SEABED FOUNDATION
- 3803855 SUBMERGED OIL STORAGE TANK  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, SUBMERGED ; SEABED FOUNDATION
- 3805534 SLIDE RESISTANT PLATFORM ANCHOR CONDUCTOR SILO  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE PLATFORM ANCHOR
- 3811289 METHODS OF GROUTING OFFSHORE STRUCTURES  
OTHER KEYWORDS: GROUTING ; PILE, STRUCTURE CONNECTION
- 3815371 OFFSHORE TOWER APPARATUS AND METHOD  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; PILE PLACEMENT
- 3817040 PILE DRIVING METHOD  
OTHER KEYWORDS: PILE DRIVER, WATER JET ; PILE, STEEL ;  
SEABED FOUNDATION ; PILE FOOTING
- 3817335 AIRGUN REPEATER POWERED PILE DRIVER  
OTHER KEYWORDS: PILE DRIVER, IMPACT

3820346 FREE PISTON WATER HAMMER PILE DRIVING  
OTHER KEYWORDS: PILE DRIVER, IMPACT

3824797 EVACUATED TUBE WATER HAMMER PILE DRIVING  
OTHER KEYWORDS: PILE DRIVER, IMPACT ; POWER, SUBMERGED SOURCE

3834337 SUBMARINE RESERVOIRS  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, SUBMERGED

3839873 METHOD OF ERECTING A TOWER ON THE SEA-BED, IN DEEP WATER  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; OFFSHORE PLATFORM, LEG ;  
PILE PLACEMENT ; SEABED FOUNDATION

3842607 ARCTIC ISLANDS  
OTHER KEYWORDS: OFFSHORE ISLAND

3842917 PUMPED EVACUATED TUBE WATER HAMMER PILE DRIVER  
OTHER KEYWORDS: PILE DRIVER, IMPACT ; POWER, SUBMERGED SOURCE

3846991 PILE DRIVING METHOD AND APPARATUS  
OTHER KEYWORDS: PILE DRIVER, IMPACT ; PILE DRIVER, VIBRATORY ;  
PILE PLACEMENT

3849993 METHOD FOR CONSTRUCTING SEA ICE ISLANDS IN COLD REGIONS  
OTHER KEYWORDS: OFFSHORE ISLAND ; ICE STRUCTURE

3849994 GUIDE BASE AND METHOD FOR SETTING SAME  
OTHER KEYWORDS: SEABED FOUNDATION ; SEABED OIL, PROCESS STRUCTURE

3852969 OFFSHORE PLATFORM STRUCTURES  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; OFFSHORE PLATFORM, LEG

3855809 UNDERWATER OIL STORAGE TANK AND METHOD OF SUBMERGING SAME  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, SUBMERGED

3857247 OFFSHORE TOWER ERECTION TECHNIQUE  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; PILE PLACEMENT

3859806 OFFSHORE PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED

3863456 METHOD FOR CONSTRUCTING ICE ISLANDS IN COLD REGIONS  
OTHER KEYWORDS: OFFSHORE ISLAND ; ICE STRUCTURE

3871181 METHOD OF FORMING AN ENCLOSURE IN A BODY OF WATER  
OTHER KEYWORDS: COFFERDAM ; OFFSHORE PLATFORM, JACK UP ;  
OFFSHORE STORAGE TANK, EMERGENT ; PILE, SHEET ; PILE, STEEL

3872679 APPARATUS AND METHOD FOR REDUCING THE FORCES ON EXTENDIBLE LEGS  
OF A FLOATING VESSEL. OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP ;  
OFFSHORE PLATFORM, LEG

3878662 METHOD OF CONSTRUCTING A REMOTELY LOCATED DRILLING STRUCTURE  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; PILE PLACEMENT ;  
SEABED FOUNDATION

3881318 ARCTIC BARRIER FORMATION  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE ISLAND ;  
OFFSHORE STRUCTURE FENDER ; ICE STRUCTURE

3881549 PRODUCTION AND FLARE CAISSON SYSTEM  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE PLATFORM, FIXED ;  
SEABED FOUNDATION ; SEABED OIL, PROCESS STRUCTURE

3889476 SUBMERSIBLE CAISSONS AND THEIR APPLICATIONS  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; OFFSHORE CAISSON ;  
OFFSHORE STORAGE TANK, EMERGENT

3893304 METHOD AND A DEVICE FOR THE UNDERWATER CONSTRUCTION  
OF CONCRETE STRUCTURES. OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ;  
OFFSHORE PLATFORM, FIXED ; SEABED MATERIAL PLACEMENT

3895471 METHOD AND APPARATUS FOR FORMING ELONGATED BATTER PILING IN SITU  
OTHER KEYWORDS: PILE PLACEMENT ; PILE SECTION CONNECTION ;  
PILE, STEEL

3896628 MARINE STRUCTURES  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; SEABED FOUNDATION

3897639 VEHICLE FOR UNDERWATER EXCAVATION BENEATH A STRUCTURE  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE PROPULSION ;  
DREDGE, SUBMERGED ; SEABED FOUNDATION

3906735 FOUNDATION METHOD FOR CAISSONS  
OTHER KEYWORDS: OFFSHORE CAISSON ; SEABED FOUNDATION

3910058 CONSTRUCTION OF IMMERSED STRUCTURES  
OTHER KEYWORDS: OFFSHORE CAISSON ; SEABED PIPELINE PLACEMENT ;  
SEABED WATER, PROCESS STRUCTURE

3911687 FOUNDATION METHOD FOR CAISSONS  
OTHER KEYWORDS: OFFSHORE CAISSON ; SEABED FOUNDATION

3922868 DEEP WATER PLATFORM CONSTRUCTION  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP ; OFFSHORE PLATFORM, LEG

3922869 PUMPED EVACUATED TUBE WATER HAMMER PILE DRIVER METHOD  
OTHER KEYWORDS: PILE DRIVER, IMPACT

3927535 JACK-UP TYPE OFFSHORE OIL PRODUCTION PLATFORM APPARATUS AND METHOD  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP ; OFFSHORE PLATFORM, LEG ;  
SEABED FOUNDATION

3927722 PILE DRIVING MOVING CYLINDER HAMMER WITH VALVED, FIXED PISTON  
OTHER KEYWORDS: PILE DRIVER, IMPACT

3928982 METHOD AND DEVICE FOR A FOUNDATION BY DEPRESSION IN AN AQUATIC SITE  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, SUBMERGED ; SEABED FOUNDATION ;  
SEABED SOIL TREATMENT

3934658 MODULAR UNDERWATER WELL PLATFORM SYSTEM  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; SEABED FOUNDATION

3938339 MEANS FOR SLOWING AND/OR DETOURING WATER CURRENTS  
AND THE PREPARATION THEREOF. OTHER KEYWORDS: FABRIC MAT ; GROIN ;  
JETTY ; SEABED FOUNDATION

3938341 STORAGE DEVICE FOR LIQUIDS  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE STORAGE TANK, EMERGENT

3938342 METHOD AND A DEVICE FOR BUILDING IMMERSED FOUNDATIONS  
OTHER KEYWORDS: CONCRETE FORM ; GROUTING ; SEABED FOUNDATION ;  
SEABED MATERIAL PLACEMENT

3945212 ARRANGEMENT IN OR RELATING TO CAISSONS OR THE LIKE  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE PLATFORM, FIXED ;  
PILE PLACEMENT ; SEABED FOUNDATION

3948056 MODULAR OFFSHORE STRUCTURE SYSTEM  
OTHER KEYWORDS: OFFSHORE PLATFORM, LEG ; PILE PLACEMENT ;  
PILE, STRUCTURE CONNECTION



- 3950954 METHOD AND APPARATUS FOR APPLYING LOADS TO PILES DRIVEN UNDER WATER  
OTHER KEYWORDS: PILE LOAD MEASUREMENT
- 3950647 POWERFUL SUBMERSIBLE DEEPWATER PILE DRIVER POWERED  
BY PRESSURIZED GAS DISCHARGE. OTHER KEYWORDS: PILE DRIVER, IMPACT
- 3961489 METHOD FOR PLACING A FLOATING STRUCTURE ON THE SEA BED  
OTHER KEYWORDS: OFFSHORE CAISSON ; SEABED FOUNDATION
- 3962080 COLUMNS FOR PLATFORMS, TIERS, CAUSEWAYS AND THE LIKE, AND METHOD  
OF ERECTING SAME. OTHER KEYWORDS: OFFSHORE CAISSON ;  
OFFSHORE PLATFORM, LOT ; PILE DRIVER, WATER JET
- 3967675 METHOD AND DEVICE FOR EXPLOITING THE GEOTHERMAL ENERGY  
IN A SUBMARINE VOLCANO. OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ;  
POWER, SUBMERGED SOURCE
- 3969900 BREAKWATER CONSTRUCTION  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; OFFSHORE CAISSON ;  
SEABED FOUNDATION
- 3976021 INSTALLATION OF VERTICALLY MOORED PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM ANCHOR ;  
OFFSHORE PLATFORM, FLOATING
- 3983828 VERTICALLY MOORED PLATFORM INSTALLATION  
OTHER KEYWORDS: OFFSHORE PLATFORM ANCHOR ;  
OFFSHORE PLATFORM, FLOATING
- 3984989 MEANS FOR PRODUCING SUBAQUEOUS AND OTHER CAST-IN-PLACE CONCRETE  
STRUCTURES IN SITU. OTHER KEYWORDS: BREAKWATER, CONCRETE ;  
CONCRETE FORM ; FABRIC MAT ; PILE, CONCRETE ; SEAWALL ;  
STRUCTURE REPAIR
- 3987638 SUBSEA STRUCTURE AND METHOD FOR INSTALLING THE STRUCTURE  
AND RECOVERING THE STRUCTURE FROM THE SEA FLOOR. OTHER KEYWORDS:  
PILE PLACEMENT ; SEABED FOUNDATION ; SEABED OIL, PROCESS STRUCTURE
- 3990252 EARTHWORKS CONSOLIDATION SYSTEM  
OTHER KEYWORDS: OFFSHORE ISLAND ; SANDBAG ; SEABED SOIL TREATMENT
- 3996756 METHOD AND APPARATUS FOR SUPPORTING A DRILLING PLATFORM  
ON THE OCEAN FLOOR. OTHER KEYWORDS: OFFSHORE PLATFORM ANCHOR ;  
SEABED FOUNDATION
- 3998061 FORMATION OF CAVITIES IN THE BED OF A SHEET OF WATER  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ;  
OFFSHORE STORAGE TANK, SUBMERGED ; SEABED FOUNDATION
- 3998064 SUBAQUEOUS PILE DRIVING APPARATUS AND METHOD  
OTHER KEYWORDS: PILE DRIVER, IMPACT ; PILE PLACEMENT
- RE20232 METHODS OF GROUTING OFFSHORE STRUCTURES  
OTHER KEYWORDS: GROUTING ; PILE, STRUCTURE CONNECTION
- OFFSHORE HARBOR
- 3958426 OFFSHORE HARBOR TANK AND INSTALLATION. OTHER KEYWORDS:  
BREAKWATER, CONCRETE ; OFFSHORE CAISSON ;  
OFFSHORE STORAGE TANK, EMERGENT

**OFFSHORE ISLAND**

- 3798912 ARTIFICIAL ISLANDS AND METHOD OF CONTROLLING ICE MOVEMENT  
IN NATURAL OR MAN-MADE BODIES OF WATER. OTHER KEYWORDS:  
ICE PROTECTION ; OFFSHORE STRUCTURE FENDER ; SEABED FOUNDATION ;  
ICE STRUCTURE
- 3803852 PROCESS FOR BUILDING AN ISLAND  
OTHER KEYWORDS: ARTIFICIAL SEAWEED ; OFFSHORE CONSTRUCTION ;  
SEABED FOUNDATION
- 3841103 CURRENT STABILIZING MEANS FOR ISLAND AIRPORT FOUNDATIONS  
OTHER KEYWORDS: SEABED FOUNDATION
- 3842607 ARCTIC ISLANDS  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION
- 3849993 METHOD FOR CONSTRUCTING SEA ICE ISLANDS IN COLD REGIONS  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; ICE STRUCTURE
- 3863456 METHOD FOR CONSTRUCTING ICE ISLANDS IN COLD REGIONS  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; ICE STRUCTURE
- 3881318 ARCTIC BARRIER FORMATION  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE CONSTRUCTION ;  
OFFSHORE STRUCTURE FENDER ; ICE STRUCTURE
- 3990252 EARTHWORKS CONSOLIDATION SYSTEM  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; SANDBAG ;  
SEABED SOIL TREATMENT

**OFFSHORE MOORING STRUCTURE**

- 3791154 MOORING STRUCTURE AND METHOD  
OTHER KEYWORDS: PILE, CONCRETE ; PILE DOLPHIN ;  
PILE SECTION CONNECTION ; PILE, STEEL
- 3793843 FLOATING BREASTING PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM ANCHOR ;  
OFFSHORE PLATFORM, FLOATING
- 3800547 OFFSHORE TERMINAL WITH UNDERWATER FOUNDATION  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED
- 3870010 MOORING SYSTEM FOR FLOATING STRUCTURES  
OTHER KEYWORDS: COPPERDAM ; OFFSHORE PLATFORM ANCHOR
- 3881530 PLANT FOR EVACUATING DREDGED MATERIAL  
OTHER KEYWORDS: DREDGE-SPOIL TRANSPORT ; HOPPER BARGE ; PUMP
- 3894567 OFFSHORE VESSEL MOORING  
OTHER KEYWORDS: OFFSHORE PLATFORM ANCHOR
- 3910057 SUBMARINE CARGO TERMINAL  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED
- 3950805 COMBINATION PROVIDING SAFETY BERTHING, UNLOADING OF OIL,  
AND CONDUIT CARRIAGE TO REFINERIES ON LAND,  
OF LARGE DEEP-SEA-REQUIRING TANKERS. OTHER KEYWORDS:  
OFFSHORE PLATFORM, FIXED ; PILE DRIVER, WATER JET ; SEABED FOUNDATION
- 3958521 DEEP SEA TANK AND SEAPORT SYSTEM  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; POLLUTANT, SUCTION REMOVAL ;  
POLLUTANT, SURFACE BARRIER

3980037 APPARATUS FOR MOORING SHIPS  
OTHER KEYWORDS: OFFSHORE PLATFORM, FLOATING

RE28332 METHOD AND APPARATUS FOR PREVENTING ICE DAMAGE TO MARINE STRUCTURES  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE PLATFORM, LEG ; OFFSHORE STRUCTURE FENDER

OFFSHORE PLATFORM ANCHOR

3785158 HYDRAULIC ENGINEERING INSTALLATIONS  
OTHER KEYWORDS: FAEPIC MAT ; OFFSHORE CONSTRUCTION ;  
OFFSHORE STORAGE TANK, EMERGENT ; SEABED FOUNDATION ;  
SEABED SOIL TREATMENT

3789921 DEVICE FOR OFF-CENTERING ABOVE-WATER ARTICULATED  
MULTIPLE-DRILLING STRUCTURES. OTHER KEYWORDS:  
OFFSHORE PLATFORM, FLOATING

3793843 FLOATING BREASTING PLATFORM  
OTHER KEYWORDS: OFFSHORE MOORING STRUCTURE ;  
OFFSHORE PLATFORM, FLOATING

3805534 SLIDE RESISTANT PLATFORM ANCHOR CONDUCTOR SILO  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE CONSTRUCTION

3824794 OFFSHORE MARINE ANCHORING STRUCTURE  
OTHER KEYWORDS: EMBEDMENT ANCHOR ; OFFSHORE PLATFORM, LEG

3870010 MOORING SYSTEM FOR FLOATING STRUCTURES  
OTHER KEYWORDS: COFFERDAM ; OFFSHORE MOORING STRUCTURE

3871184 POSITION AND ANCHORING SYSTEM FOR OFF-SHORE DRILLING PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; OFFSHORE PLATFORM, FLOATING

3894567 OFFSHORE VESSEL MOORING  
OTHER KEYWORDS: OFFSHORE MOORING STRUCTURE

3903705 APPARATUS FOR ANCHORING MARINE STRUCTURES

3934528 MEANS AND METHODS FOR ANCHORING AN OFFSHORE TENSION LEG PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM, FLOATING

3961490 ANCHORAGE OF FLOATING STRUCTURES  
OTHER KEYWORDS: OFFSHORE PLATFORM, FLOATING

3965687 APPARATUS FOR ANCHORING A STRUCTURE TO THE FLOOR OF A BODY OF WATER  
OTHER KEYWORDS: OFFSHORE CAISSON ; PILE DRIVER, WATER JET

3967393 UNDERWATER SOLIDS COLLECTING APPARATUS  
OTHER KEYWORDS: DREDGE, SUCTION

3975784 MARINE STRUCTURE  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE PROPULSION ;  
OFFSHORE PLATFORM, FLOATING ; POLLUTANT DISPERSION ;  
SEABED PIPELINE PLACEMENT ; SEABED TRENCHER

3976021 INSTALLATION OF VERTICALLY MOORED PLATFORM  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FLOATING

3982401 MARINE STRUCTURE WITH DETACHABLE ANCHOR  
OTHER KEYWORDS: OFFSHORE PLATFORM, FLOATING

3993828 VERTICALLY MOORED PLATFORM INSTALLATION  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FLOATING

3984991 ANCHOR AND METHOD OF SETTING ANCHOR  
OTHER KEYWORDS: EMBEDMENT ANCHOR

3986367 EARTHQUAKE-RESISTANT ANCHORING SYSTEM

3988898 PIPELINES AND MARINE PLATFORMS  
OTHER KEYWORDS: OFFSHORE PLATFORM, FLOATING

3996756 METHOD AND APPARATUS FOR SUPPORTING A DRILLING PLATFORM  
ON THE OCEAN FLOOR. OTHER KEYWORDS: OFFSHORE CONSTRUCTION ;  
SEABED FOUNDATION

OFFSHORE PLATFORM, FIXED

3800547 OFFSHORE TERMINAL WITH UNDERWATER FOUNDATION  
OTHER KEYWORDS: OFFSHORE MOORING STRUCTURE

3815371 OFFSHORE TOWER APPARATUS AND METHOD  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE PLACEMENT

3815372 MARINE STRUCTURE  
OTHER KEYWORDS: OFFSHORE PLATFORM, LEG ; PILE PLACEMENT

3824795 PLATFORM STRUCTURE  
OTHER KEYWORDS: OFFSHORE CAISSON ; SEABED FOUNDATION

3830068 SYSTEM FOR EARTH PENETRATION IN DEEP WATER AT ATMOSPHERIC PRESSURE  
OTHER KEYWORDS: OFFSHORE CAISSON

3831385 ARCTIC OFFSHORE PLATFORM  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE PLATFORM, JACK UP ;  
OFFSHORE STRUCTURE FENDER

3839873 METHOD OF ERECTING A TOWER ON THE SEA-BED, IN DEEP WATER  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, LEG ;  
PILE PLACEMENT ; SEABED FOUNDATION

3852969 OFFSHORE PLATFORM STRUCTURES  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, LEG

3857247 OFFSHORE TOWER ERECTION TECHNIQUE  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE PLACEMENT

3859806 OFFSHORE PLATFORM  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION

3870003 STORAGE-VESSEL  
OTHER KEYWORDS: OFFSHORE PLATFORM, FLOATING ;  
OFFSHORE STORAGE TANK, SUBMERGED

3871184 POSITION AND ANCHORING SYSTEM FOR OFF-SHORE DRILLING PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM ANCHOR ; OFFSHORE PLATFORM, FLOATING

3874180 MODULAR OFFSHORE STRUCTURE SYSTEM  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP ; PILE PLACEMENT ;  
SEABED FOUNDATION

3878662 METHOD OF CONSTRUCTING A REMOTELY LOCATED DRILLING STRUCTURE  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE PLACEMENT ;  
SEABED FOUNDATION

3879950 SPECIAL POWER GENERATING UNIT USING COMPRESSED AIR PRODUCED  
BY OCEAN WAVE TOGETHER WITH SUPER-HEATED STEAM  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; POWER, WAVE ; PUMP

3879952 PRESSURE RESISTANT CAISSON  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE PLATFORM, LEG ;  
SEABED FOUNDATION

3881549 PRODUCTION AND FLARE CAISSON SYSTEM  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE CONSTRUCTION ;  
SEABED FOUNDATION ; SEABED OIL, PROCESS STRUCTURE

3886753 SUBMERSIBLE STRUCTURES  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, SUBMERGED ; SEABED FOUNDATION

3893304 METHOD AND A DEVICE FOR THE UNDERWATER CONSTRUCTION  
OF CONCRETE STRUCTURES. OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ;  
OFFSHORE CONSTRUCTION ; SEABED MATERIAL PLACEMENT

3894504 ICE CUTTER FOR MONOPOD DRILLING PLATFORM  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE PLATFORM, LEG ;  
OFFSHORE STRUCTURE FENDER

3896628 MARINE STRUCTURES  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; SEABED FOUNDATION

3898847 FIXED PLATFORM FOR DEEP SEA DEPTHS ABLE TO HOUSE PLANTS,  
EQUIPMENTS STRUCTURES, MEN AND MEANS. OTHER KEYWORDS:  
OFFSHORE CAISSON ; SEABED FOUNDATION ; SEABED SCOUR PROTECTION

3899032 METHOD AND APPARATUS FOR DEVIATING CONDUCTOR CASING

3906734 FIXED MARINE PLATFORM WITH DISPERSED BASE  
OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ; SEABED FOUNDATION ;  
SEABED SCOUR PROTECTION

3910057 SUBMARINE CARGO TERMINAL  
OTHER KEYWORDS: OFFSHORE MOORING STRUCTURE

3913335 OFFSHORE TERMINAL  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE STORAGE TANK, SUBMERGED ;  
SEABED FOUNDATION ; SEABED SCOUR PROTECTION

3914947 SUBAQUATIC STRUCTURE  
OTHER KEYWORDS: OFFSHORE CAISSON ; SEABED FOUNDATION ;  
SEABED SCOUR PROTECTION

3916632 TELESCOPIC CAISSON WITH INTERMEDIATELY POSITIONED WELLHEAD  
OTHER KEYWORDS: OFFSHORE CAISSON ; SEABED FOUNDATION

3921408 ANTI-HEAVE PROTECTIVE SYSTEM  
OTHER KEYWORDS: BREAKWATER, CONCRETE ;  
OFFSHORE STORAGE TANK, EMERGENT ; SEAWALL

3925997 BREAKWATER DEVICE FOR OFFSHORE SUBMERGED FOUNDATION STRUCTURES  
OTHER KEYWORDS: OFFSHORE PLATFORM, LEG ; OFFSHORE STRUCTURE FENDER ;  
PILE PROTECTION

3930168 WAVE-ACTION POWER APPARATUS  
OTHER KEYWORDS: POWER, WAVE ; PUMP

3934658 MODULAR UNDERWATER WELL PLATFORM SYSTEM  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; SEABED FOUNDATION

3938343 PLATFORM STRUCTURE FOR MARITIME INSTALLATION  
OTHER KEYWORDS: PILE DRIVER, WATER JET ; SEABED FOUNDATION

3945212 ARRANGEMENT IN OR RELATING TO CAISSONS OR THE LIKE  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE CONSTRUCTION ;  
PILE PLACEMENT ; SEABED FOUNDATION

3946568 OFFSHORE OIL PRODUCTION PLATFORM  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, SUBMERGED ;  
SEABED OIL, PROCESS STRUCTURE

- 3950805 COMBINATION PROVIDING SAFETY BERTHING, UNLOADING OF OIL,  
AND CONDUIT CARRIAGE TO REFINERIES ON LAND,  
OF LARGE DEEP-SEA-REQUIRING TANKERS.OTHER KEYWORDS:  
OFFSHORE MOORING STRUCTURE ; PILE DRIVER, WATER JET ;  
SEABED FOUNDATION
- 3952527 OFFSHORE PLATFORM FOR ARCTIC ENVIRONMENTS  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE STRUCTURE FENDER ;  
ICE STRUCTURE
- 3955372 METHOD OF INSTALLING A FIXED MARINE PLATFORM WITH DISPERSED BASE  
OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ; SEABED FOUNDATION ;  
SEABED MATERIAL PLACEMENT ; SEABED SCOUR PROTECTION
- 3958521 DEEP SEA TANK AND SEAPORT SYSTEM  
OTHER KEYWORDS: OFFSHORE MOORING STRUCTURE ;  
POLLUTANT, SUCTION REMOVAL ; POLLUTANT, SURFACE BARRIER
- 3962877 OFF-SHORE POWER PLANT  
OTHER KEYWORDS: ELECTRICAL GENERATOR
- 3962878 STABILIZATION OF MARITIME STRUCTURES  
OTHER KEYWORDS: SEABED FOUNDATION ; SEABED SOIL TREATMENT
- 3965688 UNDERWATER STRUCTURES, IN PARTICULAR FOR UNDERWATER  
DRILLING OPERATIONS.OTHER KEYWORDS: SEABED FOUNDATION
- 3967675 METHOD AND DEVICE FOR EXPLOITING THE GEOTHERMAL ENERGY  
IN A SUBMARINE VOLCANO.OTHER KEYWORDS: OFFSHORE CONSTRUCTION ;  
POWER, SUBMERGED SOURCE
- 3972137 DREDGING INSTALLATION  
OTHER KEYWORDS: DREDGE, SUCTION
- 3972199 LOW ADHESIONAL ARCTIC OFFSHORE PLATFORM  
OTHER KEYWORDS: COATING ; ICE PROTECTION ; OFFSHORE STRUCTURE FENDER
- 3977200 LIGHTHOUSE OR BEACON CONSTRUCTION  
OTHER KEYWORDS: ICE PROTECTION
- 3987636 METHODS AND APPARATUS FOR ANCHORING A SUBMERGED STRUCTURE  
TO A WATERBED.OTHER KEYWORDS: GROUTING ; OFFSHORE PLATFORM, LEG ;  
PILE FOOTING ; PILE,STRUCTURE CONNECTION ; SEABED FOUNDATION
- 3990253 METHOD FOR CONSTRUCTING AN ICE PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM, LEG ; ICE STRUCTURE
- 3990254 MARINE STRUCTURE FOR OFFSHORE ACTIVITIES  
OTHER KEYWORDS: OFFSHORE PLATFORM, LEG ; SEABED OIL, PROCESS STRUCTURE
- 3991563 HYDROELECTRIC POWER PLANT  
OTHER KEYWORDS: ELECTRICAL GENERATOR
- 3991581 METHOD AND APPARATUS FOR HANDLING PILING AND ANCHORING  
AN OFFSHORE TOWER.OTHER KEYWORDS: OFFSHORE PLATFORM, LEG ;  
PILE PLACEMENT ; PILE SECTION CONNECTION
- 3998061 FORMATION OF CAVITIES IN THE BED OF A SHEET OF WATER  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ;  
OFFSHORE STORAGE TANK, SUBMERGED ; SEABED FOUNDATION
- 3999395 SUPPORT ARRANGEMENT FOR A CONSTRUCTION  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, SUBMERGED ; SEABED FOUNDATION

RE28332 METHOD AND APPARATUS FOR PREVENTING ICE DAMAGE TO MARINE STRUCTURES  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE MOORING STRUCTURE ;  
OFFSHORE PLATFORM, LEG ; OFFSHORE STRUCTURE FENDER

OFFSHORE PLATFORM, FLOATING

- 3789921 DEVICE FOR OFF-CENTERING ABOVE-WATER ARTICULATED  
MULTIPLE-DRILLING STRUCTURES. OTHER KEYWORDS:  
OFFSHORE PLATFORM ANCHOR
- 3793843 FLOATING BREASTING PLATFORM  
OTHER KEYWORDS: OFFSHORE MOORING STRUCTURE ;  
OFFSHORE PLATFORM ANCHOR
- 3870003 STORAGE-VESSEL  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ;  
OFFSHORE STORAGE TANK, SUBMERGED
- 3871184 POSITION AND ANCHORING SYSTEM FOR OFF-SHORE DRILLING PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM ANCHOR ; OFFSHORE PLATFORM, FIXED
- 3910111 WAVE HEIGHT MEASURING DEVICE  
OTHER KEYWORDS: WAVE MEASUREMENT
- 3912938 ELECTRICAL STATIONS OPERATED BY WAVES  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; POWER, WAVE
- 3934528 MEANS AND METHODS FOR ANCHORING AN OFFSHORE TENSION LEG PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM ANCHOR
- 3961490 ANCHORAGE OF FLOATING STRUCTURES  
OTHER KEYWORDS: OFFSHORE PLATFORM ANCHOR
- 3975784 MARINE STRUCTURE  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE PROPULSION ;  
OFFSHORE PLATFORM ANCHOR ; POLLUTANT DISPERSION ;  
SEABED PIPELINE PLACEMENT ; SEABED TRENCHER
- 3976021 INSTALLATION OF VERTICALLY MOORED PLATFORM  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM ANCHOR
- 3980037 APPARATUS FOR MOORING SHIPS  
OTHER KEYWORDS: OFFSHORE MOORING STRUCTURE
- 3982401 MARINE STRUCTURE WITH DETACHABLE ANCHOR  
OTHER KEYWORDS: OFFSHORE PLATFORM ANCHOR
- 3983828 VERTICALLY MOORED PLATFORM INSTALLATION  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM ANCHOR
- 3988898 PIPELINES AND MARINE PLATFORMS  
OTHER KEYWORDS: OFFSHORE PLATFORM ANCHOR
- 3995160 METHOD AND APPARATUS FOR OBTAINING ELECTRICAL POWER FROM SEA WATER  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; POWER, SUBMERGED SOURCE

OFFSHORE PLATFORM, JACK UP

- 3792538 ARTIFICIAL ISLAND FORMED OF HINGEDLY INTERCONNECTED PONTOONS  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; OFFSHORE PLATFORM, WALKING
- 3793840 MOBILE, ARCTIC DRILLING AND PRODUCTION PLATFORM  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE CAISSON ;  
SEABED FOUNDATION

3797256 JACK-UP TYPE OFFSHORE PLATFORM APPARATUS  
OTHER KEYWORDS: OFFSHORE PLATFORM, LEG ; PILE PLACEMENT ;  
SEABED FOUNDATION

3823563 SPUD TANK FOR OFFSHORE DRILLING UNIT  
OTHER KEYWORDS: OFFSHORE PLATFORM, LEG ; SEABED FOUNDATION

3826099 SELF-ELEVATING OFFSHORE PLATFORM WITH FOLDING LEGS  
OTHER KEYWORDS: OFFSHORE PLATFORM, LEG

3828561 DRILLING PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM, LEG

3830071 JACK-UP DRILLING PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM, LEG

3831385 ARCTIC OFFSHORE PLATFORM  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE STRUCTURE FENDER

3851482 SECTIONALIZED LEG FOR DRILLING PLATFORM AND METHOD  
OF ASSEMBLING SAME. OTHER KEYWORDS: OFFSHORE PLATFORM, LEG

3871181 METHOD OF FORMING AN ENCLOSURE IN A BODY OF WATER  
OTHER KEYWORDS: COFFERDAM ; OFFSHORE CONSTRUCTION ;  
OFFSHORE STORAGE TANK, EMERGENT ; PILE, SHEET ; PILE, STEEL

3872679 APPARATUS AND METHOD FOR REDUCING THE FORCES ON EXTENDIBLE LEGS  
OF A FLOATING VESSEL. OTHER KEYWORDS: OFFSHORE CONSTRUCTION ;  
OFFSHORE PLATFORM, LEG

3874180 MODULAR OFFSHORE STRUCTURE SYSTEM  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; PILE PLACEMENT ;  
SEABED FOUNDATION

3916633 MEANS FOR ALTERING MOTION RESPONSE OF OFFSHORE DRILLING UNITS  
OTHER KEYWORDS: OFFSHORE PLATFORM, LEG

3922868 DEEP WATER PLATFORM CONSTRUCTION  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, LEG

3927535 JACK UP TYPE OFFSHORE OIL PRODUCTION PLATFORM APPARATUS AND METHOD  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, LEG ;  
SEABED FOUNDATION

3967457 SELF-ELEVATING OFFSHORE DRILLING UNIT LEGS  
OTHER KEYWORDS: OFFSHORE PLATFORM, LEG

3967458 MARINE APPARATUS HAVING TELESCOPIC LEGS

3986368 LOAD EQUALIZING AND SHOCK ABSORBER SYSTEM FOR OFF-SHORE DRILLING RIGS  
OTHER KEYWORDS: OFFSHORE PLATFORM, LEG

3996754 MOBILE MARINE DRILLING UNIT  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, SUBMERGED ; SEABED FOUNDATION

OFFSHORE PLATFORM, LEG

3797256 JACK-UP TYPE OFFSHORE PLATFORM APPARATUS  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP ; PILE PLACEMENT ;  
SEABED FOUNDATION

3797258 SHIM TAKE-UP RING FOR PILE CONNECTION  
OTHER KEYWORDS: PILE, STRUCTURE CONNECTION



3807179 DEICING SYSTEMS  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE STRUCTURE FENDER

3815372 MARINE STRUCTURE  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; PILE PLACEMENT

3823563 SPUD TANK FOR OFFSHORE DRILLING UNIT  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP ; SEABED FOUNDATION

3824794 OFFSHORE MARINE ANCHORING STRUCTURE  
OTHER KEYWORDS: EMBEDMENT ANCHOR ; OFFSHORE PLATFORM ANCHOR

3826099 SELF-ELEVATING OFFSHORE PLATFORM WITH FOLDING LEGS  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP

3828561 DRILLING PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP

3830071 JACK-UP DRILLING PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP

3839873 METHOD OF ERECTING A TOWER ON THE SEA-BED, IN DEEP WATER  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FIXED ;  
PILE PLACEMENT ; SEABED FOUNDATION

3851482 SECTIONALIZED LEG FOR DRILLING PLATFORM AND METHOD OF ASSEMBLING SAME  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP

3852969 OFFSHORE PLATFORM STRUCTURES  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FIXED

3872679 APPARATUS AND METHOD FOR REDUCING THE FORCES ON EXTENDIBLE LEGS  
OF A FLOATING VESSEL. OTHER KEYWORDS: OFFSHORE CONSTRUCTION ;  
OFFSHORE PLATFORM, JACK UP

3878687 GROUTING OF OFFSHORE STRUCTURES  
OTHER KEYWORDS: GROUTING ; PILE, STRUCTURE CONNECTION

3879952 PRESSURE RESISTANT CAISSON  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE PLATFORM, FIXED ;  
SEABED FOUNDATION

3894504 ICE CUTTER FOR MONOPOD DRILLING PLATFORM  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE STRUCTURE FENDER

3916633 MEANS FOR ALTERING MOTION RESPONSE OF OFFSHORE DRILLING UNITS  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP

3922868 DEEP WATER PLATFORM CONSTRUCTION  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, JACK UP

3925997 BREAKWATER DEVICE FOR OFFSHORE SUBMERGED FOUNDATION STRUCTURES  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; OFFSHORE STRUCTURE FENDER ;  
PILE PROTECTION

3927535 JACK-UP TYPE OFFSHORE OIL PRODUCTION PLATFORM APPARATUS AND METHOD  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, JACK UP ;  
SEABED FOUNDATION

3948056 MODULAR OFFSHORE STRUCTURE SYSTEM  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE PLACEMENT ;  
PILE, STRUCTURE CONNECTION

- 3962880 COLUMNS FOR PLATFORMS, PIERS, CAUSEWAYS AND THE LIKE, AND METHOD  
OF ERECTING SAME. OTHER KEYWORDS: OFFSHORE CAISSON ;  
OFFSHORE CONSTRUCTION ; PILE DRIVER, WATER JET
- 3967457 SELF-ELEVATING OFFSHORE DRILLING UNIT LEGS  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP
- 3986368 LOAD EQUALIZING AND SHOCK ABSORBER SYSTEM FOR OFF-SHORE DRILLING RIGS  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP
- 3987636 METHODS AND APPARATUS FOR ANCHORING A SUBMERGED STRUCTURE  
TO A WATERBED. OTHER KEYWORDS: GROUTING ; OFFSHORE PLATFORM, FIXED ;  
PILE FOOTING ; PILE, STRUCTURE CONNECTION ; SEABED FOUNDATION
- 3990253 METHOD FOR CONSTRUCTING AN ICE PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; ICE STRUCTURE
- 3990254 MARINE STRUCTURE FOR OFFSHORE ACTIVITIES  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ;  
SEABED OIL, PROCESS STRUCTURE
- 3991581 METHOD AND APPARATUS FOR HANDLING PILING AND ANCHORING  
AN OFFSHORE TOWER. OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ;  
PILE PLACEMENT ; PILE SECTION CONNECTION
- 3992272 SUBMERGED OFFSHORE PLATFORM JOINT PROTECTION  
OTHER KEYWORDS: CATHODIC PROTECTION ; COATING ; CORROSION PREVENTION
- RE28332 METHOD AND APPARATUS FOR PREVENTING ICE DAMAGE TO MARINE STRUCTURES  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE MOORING STRUCTURE ;  
OFFSHORE PLATFORM, FIXED ; OFFSHORE STRUCTURE FENDER

OFFSHORE PLATFORM, WALKING

- 3792538 ARTIFICIAL ISLAND FORMED OF HINGEDLY INTERCONNECTED PONTOONS  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; OFFSHORE PLATFORM, JACK UP

OFFSHORE STORAGE TANK-EMERGENT

- 3785158 HYDRAULIC ENGINEERING INSTALLATIONS  
OTHER KEYWORDS: FABRIC MAT ; OFFSHORE CONSTRUCTION ;  
OFFSHORE PLATFORM ANCHOR ; SEABED FOUNDATION ;  
SEABED SOIL TREATMENT
- 3791152 OFFSHORE STORAGE SYSTEM  
OTHER KEYWORDS: SEABED FOUNDATION
- 3828565 OFFSHORE LIQUID STORAGE FACILITY
- 3844122 PROTECTED OFFSHORE STORAGE FACILITY  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; POLLUTANT COLLECTION
- 3858402 OIL STORAGE TERMINALS
- 3871181 METHOD OF FORMING AN ENCLOSURE IN A BODY OF WATER  
OTHER KEYWORDS: COPPERDAM ; OFFSHORE CONSTRUCTION ;  
OFFSHORE PLATFORM, JACK UP ; PILE, SHEET ; PILE, STEEL
- 3889476 SUBMERSIBLE CAISSONS AND THEIR APPLICATIONS  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; OFFSHORE CAISSON ;  
OFFSHORE CONSTRUCTION
- 3889477 CRUDE OIL OFFSHORE STORAGE VESSEL
- 3898846 OFFSHORE STORAGE TANK

3901040 COLLISION BUMPER FOR OFFSHORE STRUCTURES  
OTHER KEYWORDS: COLLISION PROTECTION ; OFFSHORE STRUCTURE FENDER

3921408 ANTI-HEAVE PROTECTIVE SYSTEM  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; OFFSHORE PLATFORM, FIXED ; SEAWALL

3938341 STORAGE DEVICE FOR LIQUIDS  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE CONSTRUCTION

3958426 OFFSHORE HARBOR TANK AND INSTALLATION  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; OFFSHORE CAISSON ; OFFSHORE HARBOR

3998062 SEA FLOOR SUPPORTED STRUCTURES WITH CRUSHABLE SUPPORT  
OTHER KEYWORDS: SEABED FOUNDATION

OFFSHORE STORAGE TANK, SUBMERGED

3793842 SELF-STABILIZING SUBMARINE TANK  
OTHER KEYWORDS: SEABED FOUNDATION

3803855 SUBMERGED OIL STORAGE TANK  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; SEABED FOUNDATION

3824942 OFFSHORE UNDERWATER STORAGE TANK

3826098 METHOD AND MEANS FOR REDUCING WAVE PRESSURES  
ON UNDERSEA CONSTRUCTIONS, OTHER KEYWORDS: SEABED FOUNDATION

3834337 SUBMARINE RESERVOIRS  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION

3835653 UNDERWATER STORAGE DEVICE

3835654 SUBMERSIBLE TANKS CONTAINING OIL OR SIMILAR LIQUIDS

3855809 UNDERWATER OIL STORAGE TANK AND METHOD OF SUBMERGING SAME  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION

3870003 STORAGE-VESSEL  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; OFFSHORE PLATFORM, FLOATING

3874179 SUBMARINE OIL STORAGE TANK SYSTEM  
OTHER KEYWORDS: PILE, STEEL

3886753 SUBMERSIBLE STRUCTURES  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; SEABED FOUNDATION

3913335 OFFSHORE TERMINAL  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE PLATFORM, FIXED ; SEABED FOUNDATION ; SEABED SCOUR PROTECTION

3928982 METHOD AND DEVICE FOR A FOUNDATION BY DEPRESSION IN AN AQUATIC SITE  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; SEABED FOUNDATION ; SEABED SOIL TREATMENT

3943724 UNDERWATER STATIONARY TANK FOR STORING LARGE AMOUNTS OF CRUDE OIL  
OTHER KEYWORDS: SEABED FOUNDATION

3946568 OFFSHORE OIL PRODUCTION PLATFORM  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; SEABED OIL, PROCESS STRUCTURE

3974657 MODULAR OFFSHORE STRUCTURE SYSTEM  
OTHER KEYWORDS: PILE PLACEMENT ; SEABED FOUNDATION

- 3996754 MOBILE MARINE DRILLING UNIT  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP ; SEABED FOUNDATION
- 3998061 FORMATION OF CAVITIES IN THE BED OF A SHEET OF WATER  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FIXED ;  
SEABED FOUNDATION
- 3999395 SUPPORT ARRANGEMENT FOR A CONSTRUCTION  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; SEABED FOUNDATION

OFFSHORE STRUCTURE FENDER

- 3798912 ARTIFICIAL ISLANDS AND METHOD OF CONTROLLING ICE MOVEMENT  
IN NATURAL OR MAN-MADE BODIES OF WATER. OTHER KEYWORDS:  
ICE PROTECTION ; OFFSHORE ISLAND ; SEABED FOUNDATION ; ICE STRUCTURE
- 3807179 DEICING SYSTEMS  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE PLATFORM, LEG
- 3831385 ARCTIC OFFSHORE PLATFORM  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE PLATFORM, JACK UP
- 3845633 INTERCEPTOR FOR PREVENTING SHIP COLLISIONS WITH OFFSHORE POWER  
STATIONS AND THE LIKE. OTHER KEYWORDS: COLLISION PROTECTION
- 3881318 ARCTIC BARRIER FORMATION  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE CONSTRUCTION ;  
OFFSHORE ISLAND ; ICE STRUCTURE
- 3894504 ICE CUTTER FOR MONOPOD DRILLING PLATFORM  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE PLATFORM, LEG
- 3901040 COLLISION BUMPER FOR OFFSHORE STRUCTURES  
OTHER KEYWORDS: COLLISION PROTECTION ; OFFSHORE STORAGE TANK, EMERGENT
- 3925997 BREAKWATER DEVICE FOR OFFSHORE SUBMERGED FOUNDATION STRUCTURES  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; OFFSHORE PLATFORM, LEG ;  
PILE PROTECTION
- 3937170 BUMPER GUARD AND ARRANGEMENT FOR WATER COVERED AREAS  
OTHER KEYWORDS: PIER FENDER
- 3952527 OFFSHORE PLATFORM FOR ARCTIC ENVIRONMENTS  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE PLATFORM, FIXED ;  
ICE STRUCTURE
- 3972199 LOW ADHESIONAL ARCTIC OFFSHORE PLATFORM  
OTHER KEYWORDS: COATING ; ICE PROTECTION ; OFFSHORE PLATFORM, FIXED
- 3991582 ROTATING-BUMPER FENDER SYSTEM  
OTHER KEYWORDS: COLLISION PROTECTION
- 3995437 SHOCK ABSORBING ARRANGEMENT FOR A MARINE STRUCTURE  
OTHER KEYWORDS: COLLISION PROTECTION ; PIER FENDER ; PILE PROTECTION
- RE28332 METHOD AND APPARATUS FOR PREVENTING ICE DAMAGE TO MARINE STRUCTURES  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE MOORING STRUCTURE ;  
OFFSHORE PLATFORM, FIXED ; OFFSHORE PLATFORM, LEG

PIER FENDER

- 3788082 ASSEMBLED FENDER UNIT

3788260 SHOCK ABSORBER FOR USE AS A FENDER FOR SHIPS  
 3798916 ARTICULATED ENERGY ABSORBING MARINE FENDER ASSEMBLY  
 3803853 DOCK FENDER STRUCTURE  
 3820495 FENDER  
 3828715 AIR CUSHION TYPE FENDER FOR USE WITH A QUAY-WALL  
 3842779 BOAT MOORING AND GUARD DEVICE  
 OTHER KEYWORDS: SMALL-CRAFT MOORING DEVICE  
 3853084 DOCK AND WHARF FENDERS  
 3863589 FENDER SYSTEM  
 3864922 SEALED CUSHIONING UNIT  
 3890916 FENDER FOR MOORING POSTS OR THE LIKE  
 3890917 MARINE FENDERS  
 OTHER KEYWORDS: TIRES  
 3918384 FENDER  
 3933111 DOCK BUMPER UNIT  
 3937176 BUMPER GUARD AND ARRANGEMENT FOR WATER COVERED AREAS  
 OTHER KEYWORDS: OFFSHORE STRUCTURE FENDER  
 3949697 MARINE FENDER ASSEMBLY HAVING A MULTISTAGE  
 SHOCK-ABSORBING PERFORMANCE  
 3950953 PILING FENDER  
 OTHER KEYWORDS: PILE PROTECTION  
 3961593 DOCK FENDER ASSEMBLY  
 OTHER KEYWORDS: SMALL-CRAFT MOORING DEVICE  
 3975916 LAMINATED PIER BUMPER  
 OTHER KEYWORDS: PILE PROTECTION  
 3995437 SHOCK ABSORBING ARRANGEMENT FOR A MARINE STRUCTURE  
 OTHER KEYWORDS: COLLISION PROTECTION ; OFFSHORE STRUCTURE FENDER ;  
 PILE PROTECTION  
 3999399 PROTECTIVE GUARD MEANS FOR WOOD PILING AND A METHOD  
 OF INSTALLING SAME UNDER DRY WORKING CONDITIONS.OTHER KEYWORDS:  
 COATING ; COLLISION PROTECTION ; FOULING PREVENTION ; PILE PROTECTION ;  
 PILE, WOOD  
 3999497 SHOCK-ABSORBING BUFFER FOR BOARDING FENDER  
 PIER, FIXED  
 3824796 MOBILE DOCK STRUCTURE  
 OTHER KEYWORDS: PIER, MOBILE ; SMALL-CRAFT PIER  
 3841104 REMOVABLE DOCK  
 OTHER KEYWORDS: PIER, MOBILE ; PILE SECTION CONNECTION  
 3952528 BOAT DOCK STRUCTURES  
 OTHER KEYWORDS: SMALL-CRAFT PIER  
 3953980 DOCK STRUCTURE  
 OTHER KEYWORDS: PIER, MOBILE ; SMALL-CRAFT LAUNCHER ; SMALL-CRAFT PIER

3984987 SILT AND POLLUTION CONTROL FOR MARINE FACILITY  
OTHER KEYWORDS: CHANNEL PROTECTION ; POLLUTANT, SUBMERGED BARRIER ;  
POLLUTANT, SURFACE BARRIER

3999397 MODULAR DOCK SYSTEM  
OTHER KEYWORDS: SMALL-CRAFT PIER

#### PIER, FLOATING

3799093 FLOATING PRESTRESSED CONCRETE WHARF

3831538 FLOATING STRUCTURE FOR THE MOORING OF YACHTS AND OTHER SIMILAR CRAFT  
OTHER KEYWORDS: SMALL-CRAFT PIER

3834336 FLOATING SPACE FRAME  
OTHER KEYWORDS: TIRES

3861340 FLOATING DOCK STRUCTURE  
OTHER KEYWORDS: SMALL-CRAFT PIER

3869532 METHOD OF MANUFACTURING FLOATING BOAT DOCK MODULES  
OTHER KEYWORDS: SMALL-CRAFT PIER

3897741 FLOATING DOCK STRUCTURE, AND THE RELATIVE SERVICE GANGWAY

3967569 FLOATING DOCK  
OTHER KEYWORDS: SMALL-CRAFT PIER

3970169 GANGWAY LADDER  
OTHER KEYWORDS: SMALL-CRAFT PIER

3974789 FLOATING STRUCTURES INCLUDING HONEYCOMB CORES FORMED  
OF ELONGATE HEXAGONAL CELLS

3977344 FLOATABLE CONCRETE STRUCTURES  
OTHER KEYWORDS: SMALL-CRAFT PIER

#### PIER, MOBILE

3824796 MOBILE DOCK STRUCTURE  
OTHER KEYWORDS: PIER, FIXED ; SMALL-CRAFT PIER

3841104 REMOVABLE DOCK  
OTHER KEYWORDS: PIER, FIXED ; PILE SECTION CONNECTION

3953980 DOCK STRUCTURE  
OTHER KEYWORDS: PIER, FIXED ; SMALL-CRAFT LAUNCHER ; SMALL-CRAFT PIER

#### PILE DOLPHIN

3791154 MOORING STRUCTURE AND METHOD  
OTHER KEYWORDS: OFFSHORE MOORING STRUCTURE ; PILE, CONCRETE ;  
PILE SECTION CONNECTION ; PILE, STEEL

3834168 SLIP-JOINTED PILE AND DOLPHIN CONSTRUCTION  
OTHER KEYWORDS: PILE SECTION CONNECTION ; PILE, STEEL

3852968 TORSION-MODE BREASTING DOLPHIN  
OTHER KEYWORDS: PILE, STEEL

3905199 FOOTED DOLPHINS

#### PILE DRIVER LEADS

3888317 HYDRAULIC PILE DRIVER

3920083 PILE DRIVING AND DRAWING APPARATUS  
OTHER KEYWORDS: PILE DRIVER, VIBRATORY ; PILE EXTRACTOR

PILE DRIVER, IMPACT

3782483 PERCUSSION HAMMER

3788402 AUTOMATICALLY SELF-REGULATING VARIABLE-STROKE, VARIABLE-RATE  
AND QUIET-OPERATING PILE DRIVER APPARATUS. OTHER KEYWORDS:  
PILE EXTRACTOR

3800548 WATER HAMMER PILE DRIVING WITH CONDENSABLE VAPOR RESET  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION

3817091 PILE DRIVER DRIVE CAP  
OTHER KEYWORDS: PILE LOAD MEASUREMENT

3817335 AIRGUN REPEATER POWERED PILE DRIVER  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION

3820346 FREE PISTON WATER HAMMER PILE DRIVING  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION

3824797 EVACUATED TUBE WATER HAMMER PILE DRIVING  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; POWER, SUBMERGED SOURCE

3828866 IMPULSE DRIVING APPARATUS

3838741 PILE HAMMERS

3842917 PUMPED EVACUATED TUBE WATER HAMMER PILE DRIVER  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; POWER, SUBMERGED SOURCE

3846991 PILE DRIVING METHOD AND APPARATUS  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE DRIVER, VIBRATORY ;  
PILE PLACEMENT

3847230 SYSTEM FOR DRIVING OBJECTS USING PRESSURE OR TRACTION FORCES  
OTHER KEYWORDS: PILE DRIVER, VIBRATORY ; PILE EXTRACTOR

3897835 PILE DRIVER DRIVE CAP  
OTHER KEYWORDS: PILE LOAD MEASUREMENT

3922869 PUMPED EVACUATED TUBE WATER HAMMER PILE DRIVER METHOD  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION

3927722 PILE DRIVING MOVING CYLINDER HAMMER WITH VALVED, FIXED PISTON  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION

3932999 PILE DRIVING

3935908 PILE HAMMERS

3958647 POWERFUL SUBMERSIBLE DEEPWATER PILE DRIVER POWERED  
BY PRESSURIZED GAS DISCHARGE. OTHER KEYWORDS: OFFSHORE CONSTRUCTION

3964264 WAVE-ACTION UNDERSEA-DRILLING RIG  
OTHER KEYWORDS: POWER, WAVE ; SAMPLER, POWER SUPPLY ;  
SAMPLER, SEABED-DRILLED CORE

3967688 FUEL INJECTION DEVICE FOR AN IMPACT ATOMIZATION-TYPE DIESEL  
PILE HAMMER

3998064 SUBAQUEOUS PILE DRIVING APPARATUS AND METHOD  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE PLACEMENT

**PILE DRIVER, VIBRATORY**

- 3808820 PILE DRIVING UTILIZING STANDING WAVE VIBRATIONS
- 3815373 PILING CLAMP  
OTHER KEYWORDS: PILE EXTRACTOR
- 3822557 JET SHEET AND CIRCULAR PILE WITH WATER HAMMER ASSIST  
OTHER KEYWORDS: PILE DRIVER, WATER JET ; PILE-DRIVING SHOE ;  
PILE, SHEET ; PILE, STEEL
- 3828864 PILE DRIVER AND EXTRACTOR  
OTHER KEYWORDS: PILE EXTRACTOR
- 3846991 PILE DRIVING METHOD AND APPARATUS  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE DRIVER, IMPACT ;  
PILE PLACEMENT
- 3847230 SYSTEM FOR DRIVING OBJECTS USING PRESSURE OF TRACTION FORCES  
OTHER KEYWORDS: PILE DRIVER, IMPACT ; PILE EXTRACTOR
- 3889482 JET SHEET AND CIRCULAR PILE WITH WATER HAMMER ASSIST  
OTHER KEYWORDS: PILE DRIVER, WATER JET ; PILE-DRIVING SHOE ;  
PILE, SHEET ; PILE, STEEL
- 3920083 PILE DRIVING AND DRAWING APPARATUS  
OTHER KEYWORDS: PILE DRIVER LEADS ; PILE EXTRACTOR

**PILE DRIVER, WATER JET**

- 3817040 PILE DRIVING METHOD  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE, STEEL ;  
SEABED FOUNDATION ; PILE FOOTING
- 3822557 JET SHEET AND CIRCULAR PILE WITH WATER HAMMER ASSIST  
OTHER KEYWORDS: PILE DRIVER, VIBRATORY ; PILE-DRIVING SHOE ;  
PILE, SHEET ; PILE, STEEL
- 3839875 METHOD AND APPARATUS FOR DRIVING PILES
- 3851490 CONSTRUCTION PILE HAVING FLUID INJECTION MEANS  
OTHER KEYWORDS: PILE, STEEL
- 3889482 JET SHEET AND CIRCULAR PILE WITH WATER HAMMER ASSIST  
OTHER KEYWORDS: PILE DRIVER, VIBRATORY ; PILE-DRIVING SHOE ;  
PILE, SHEET ; PILE, STEEL
- 3938343 PLATFORM STRUCTURE FOR MARITIME INSTALLATION  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; SEABED FOUNDATION
- 3950805 COMBINATION PROVIDING SAFETY BERTHING, UNLOADING OF OIL,  
AND CONDUIT CARRIAGE TO REFINERIES ON LAND, OF LARGE  
DEEP-SEA-REQUIRING TANKERS, OTHER KEYWORDS:  
OFFSHORE MOORING STRUCTURE ; OFFSHORE PLATFORM, FIXED ;  
SEABED FOUNDATION
- 3962880 COLUMNS FOR PLATFORMS, PIERS, CAUSEWAYS AND THE LIKE,  
AND METHOD OF ERECTING SAME, OTHER KEYWORDS: OFFSHORE CAISSON ;  
OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, LEG
- 3965687 APPARATUS FOR ANCHORING A STRUCTURE TO THE FLOOR OF A BODY OF WATER  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE PLATFORM ANCHOR



**PILE-DRIVING SHOE**

- 3810363 PILE WITH REINFORCED LEADING END  
OTHER KEYWORDS: PILE, STEEL
- 3822557 JET SHEET AND CIRCULAR PILE WITH WATER HAMMER ASSIST  
OTHER KEYWORDS: PILE DRIVER, VIBRATORY ; PILE DRIVER, WATER JET ;  
PILE, SHEET ; PILE, STEEL
- 3852971 PILE STRUCTURE  
OTHER KEYWORDS: GROUTING ; PILE, STEEL
- 3881320 PILE INSTALLATION IN SUBMERGED BEARING STRATA  
OTHER KEYWORDS: PILE, CONCRETE ; PILE FOOTING ; PILE PLACEMENT
- 3889482 JET SHEET AND CIRCULAR PILE WITH WATER HAMMER ASSIST  
OTHER KEYWORDS: PILE DRIVER, VIBRATORY ; PILE DRIVER, WATER JET ;  
PILE, SHEET ; PILE, STEEL
- 3899891 POST-TENSIONED PRESTRESSED PILE ASSEMBLY  
OTHER KEYWORDS: PILE, CONCRETE ; PILE SECTION CONNECTION
- 3924413 FITTINGS AND THE LIKE FOR PIPE PILING  
OTHER KEYWORDS: PILE SECTION CONNECTION ; PILE, STEEL

**PILE EXTRACTOR**

- 3788402 AUTOMATICALLY SELF-REGULATING VARIABLE, STROKE, VARIABLE-RATE  
AND QUIET-OPERATING PILE DRIVER APPARATUS. OTHER KEYWORDS:  
PILE DRIVER, IMPACT
- 3815373 PILING CLAMP  
OTHER KEYWORDS: PILE DRIVER, VIBRATORY
- 3828864 PILE DRIVER AND EXTRACTOR  
OTHER KEYWORDS: PILE DRIVER, VIBRATORY
- 3847230 SYSTEM FOR DRIVING OBJECTS USING PRESSURE OR TRACTION FORCES  
OTHER KEYWORDS: PILE DRIVER, IMPACT ; PILE DRIVER, VIBRATORY
- 3920083 PILE DRIVING AND DRAWING APPARATUS  
OTHER KEYWORDS: PILE DRIVER LEADS , PILE DRIVER, VIBRATORY
- 3998063 METHOD AND APPARATUS FOR REMOVING CONSTRUCTION PILES

**PILE FOOTING**

- 3817040 PILE DRIVING METHOD  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE DRIVER, WATER JET ;  
PILE-STEEL ; SEABED FOUNDATION
- 3881320 PILE INSTALLATION IN SUBMERGED BEARING STRATA  
OTHER KEYWORDS: PILE, CONCRETE ; PILE-DRIVING SHOE ; PILE PLACEMENT
- 3939664 LARGE DIAMETER TUBULAR PILES AND THE BEDDING THEREOF  
OTHER KEYWORDS: GROUTING ; PILE, STEEL ; SEABED FOUNDATION
- 3987636 METHODS AND APPARATUS FOR ANCHORING A SUBMERGED STRUCTURE  
TO A WATERBED. OTHER KEYWORDS: GROUTING ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE PLATFORM, LEG ; PILE, STRUCTURE CONNECTION ; SEABED FOUNDATION

**PILE LOAD MEASUREMENT**

- 3785203 WAVE FORCE TRANSDUCER  
OTHER KEYWORDS: WAVE MEASUREMENT

- 3817091 PILE DRIVER DRIVE CAP  
OTHER KEYWORDS: PILE DRIVER, IMPACT
- 3897835 PILE DRIVER DRIVE CAP  
OTHER KEYWORDS: PILE DRIVER, IMPACT
- 3950954 METHOD AND APPARATUS FOR APPLYING LOADS TO PILES DRIVEN UNDER WATER  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION

#### PILE PLACEMENT

- 3797256 JACK UP TYPE OFFSHORE PLATFORM APPARATUS  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP ; OFFSHORE PLATFORM, LEG ;  
SEABED FOUNDATION
- 3815371 OFFSHORE TOWER APPARATUS AND METHOD  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FIXED
- 3815372 MARINE STRUCTURE  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; OFFSHORE PLATFORM, LEG
- 3839873 METHOD OF ERECTING A TOWER ON THE SEA-BED, IN DEEP WATER  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE PLATFORM, LEG ; SEABED FOUNDATION
- 3846991 PILE DRIVING METHOD AND APPARATUS  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE DRIVER, IMPACT ;  
PILE DRIVER, VIBRATORY
- 3857247 OFFSHORE TOWER ERECTION TECHNIQUE  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FIXED
- 3874180 MODULAR OFFSHORE STRUCTURE SYSTEM  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; OFFSHORE PLATFORM, JACK UP ;  
SEABED FOUNDATION
- 3878662 METHOD OF CONSTRUCTING A REMOTELY LOCATED DRILLING STRUCTURE  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FIXED ;  
SEABED FOUNDATION
- 3881320 PILE INSTALLATION IN SUBMERGED BEARING STRATA  
OTHER KEYWORDS: PILE, CONCRETE ; PILE FOOTING ; PILE-DRIVING SHOE
- 3891037 REMOTELY OPERATED SEAFLOOR CORING AND DRILLING METHOD AND SYSTEM  
OTHER KEYWORDS: EMBEDMENT ANCHOR ; INSTRUMENT DEPLOYMENT ;  
SAMPLER, SEABED-DRILLED CORE
- 3895471 METHOD AND APPARATUS FOR FORMING ELONGATED BATTER PILING IN SITU  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE SECTION CONNECTION ;  
PILE, STEEL
- 3945212 ARRANGEMENT IN OR RELATING TO CAISSONS OR THE LIKE  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE CONSTRUCTION ;  
OFFSHORE PLATFORM, FIXED ; SEABED FOUNDATION
- 3948056 MODULAR OFFSHORE STRUCTURE SYSTEM  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, LEG ;  
PILE, STRUCTURE CONNECTION
- 3974657 MODULAR OFFSHORE STRUCTURE SYSTEM  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, SUBMERGED ; SEABED FOUNDATION
- 3987638 SUBSEA STRUCTURE AND METHOD FOR INSTALLING THE STRUCTURE  
AND RECOVERING THE STRUCTURE FROM THE SEA FLOOR. OTHER KEYWORDS:  
OFFSHORE CONSTRUCTION ; SEABED FOUNDATION ;  
SEABED OIL, PROCESS STRUCTURE

3991581 METHOD AND APPARATUS FOR HANDLING PILING AND ANCHORING  
AN OFFSHORE TOWER OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ;  
OFFSHORE PLATFORM, LEG ; PILE SECTION CONNECTION

3998064 SUBAQUEOUS PILE DRIVING APPARATUS AND METHOD  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE DRIVER, IMPACT

PILE PROTECTION

3924414 PILE FOR USE IN OFFSHORE AREAS HAVING A SHIFTING LAYER OF MUD  
OTHER KEYWORDS: SEABED FOUNDATION ; SEABED SOIL TREATMENT

3925997 BREAKWATER DEVICE FOR OFFSHORE SUBMERGED FOUNDATION STRUCTURES  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; OFFSHORE PLATFORM, LEG ;  
OFFSHORE STRUCTURE FENDER

3950953 PILING FENDER  
OTHER KEYWORDS: PIER FENDER

3972198 METHOD OF PROTECTING A PILE IMBEDDED IN OFFSHORE AREAS  
HAVING A SHIFTING LAYER OF MUD. OTHER KEYWORDS: SEABED FOUNDATION ;  
SEABED SOIL TREATMENT

3975916 LAMINATED PIER BUMPER  
OTHER KEYWORDS: PIER FENDER

3995437 SHOCK ABSORBING ARRANGEMENT FOR A MARINE STRUCTURE  
OTHER KEYWORDS: COLLISION PROTECTION ; OFFSHORE STRUCTURE FENDER ;  
PIER FENDER

3996757 APPARATUS FOR PROTECTING METALLIC STRUCTURAL ELEMENTS  
AGAINST CORROSION. OTHER KEYWORDS: COATING ; CORROSION PREVENTION ;  
PILE, STEEL

3999399 PROTECTIVE GUARD MEANS FOR WOOD PILING AND A METHOD  
OF INSTALLING SAME UNDER DRY WORKING CONDITIONS  
OTHER KEYWORDS: COATING ; COLLISION PROTECTION ;  
FOULING PREVENTION ; PIER FENDER ; PILE, WOOD

PILE SECTION CONNECTION

3791154 MOORING STRUCTURE AND METHOD  
OTHER KEYWORDS: OFFSHORE MOORING STRUCTURE ; PILE, CONCRETE ;  
PILE DOLPHIN ; PILE, STEEL

3796057 PILE SPLICER WITH RETAINING MEANS  
OTHER KEYWORDS: PILE, STEEL

3802206 PILE SPLICER  
OTHER KEYWORDS: PILE, WOOD

3828563 METHOD AND APPARATUS FOR TIGHTENING THE WATER-SUBMERGED JOINTS  
BETWEEN WALL-FORMING ELEMENTS. OTHER KEYWORDS: PILE, SHEET ;  
PILE, STEEL

3834168 SLIP-JOINTED PILE AND DOLPHIN CONSTRUCTION  
OTHER KEYWORDS: PILE DOLPHIN ; PILE, STEEL

3841104 REMOVABLE DOCK  
OTHER KEYWORDS: PIER, FIXED ; PIER, MOBILE

3890794 METHOD OF REPLACING PILING  
OTHER KEYWORDS: PILE, CONCRETE ; PILE, STRUCTURE CONNECTION ;  
PILE, WOOD ; STRUCTURE REPAIR

3895471 METHOD AND APPARATUS FOR FORMING ELONGATED BATTER PILING IN SITU  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE PLACEMENT ; PILE, STEEL

3899891 POST-TENSIONED PRESTRESSED PILE ASSEMBLY  
OTHER KEYWORDS: PILE, CONCRETE ; PILE-DRIVING SHOE

3901042 REINFORCED CONCRETE PILE AND A METHOD OF MANUFACTURING SUCH A PILE  
OTHER KEYWORDS: PILE, CONCRETE

3924413 FITTINGS AND THE LIKE FOR PIPE PILING  
OTHER KEYWORDS: PILE-DRIVING SHOE ; PILE, STEEL

3931716 PILE SPLICE FOR CONCRETE AND STEEL PILES OF VARIOUS CONFIGURATION  
OTHER KEYWORDS: PILE, CONCRETE ; PILE, STEEL

3953981 CONNECTING COMPONENTS FOR PILES  
OTHER KEYWORDS: PILE, CONCRETE

3961491 PILE CONNECTING DEVICE  
OTHER KEYWORDS: PILE, CONCRETE

3988899 PILE JOINER FOR CONNECTING THE ENDS OF CONCRETE PILES  
AND ITS MEMBERS. OTHER KEYWORDS: PILE, CONCRETE

3991581 METHOD AND APPARATUS FOR HANDLING PILING AND ANCHORING  
AN OFFSHORE TOWER. OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ;  
OFFSHORE PLATFORM, LEG ; PILE PLACEMENT

**PILE, CONCRETE**

3791154 MOORING STRUCTURE AND METHOD  
OTHER KEYWORDS: OFFSHORE MOORING STRUCTURE ; PILE DOLPHIN ;  
PILE SECTION CONNECTION ; PILE, STEEL

3820347 TAPERED PILES AND METHODS OF USING TAPERED PILES

3874181 HIGH LOAD CARRYING CAPACITY, FREEZE AND CRACK-PROOF  
CONCRETE METAL PILE. OTHER KEYWORDS: EMBEDMENT ANCHOR ;  
ICE PROTECTION ; PILE, STEEL

3881320 PILE INSTALLATION IN SUBMERGED BEARING STRATA  
OTHER KEYWORDS: PILE FOOTING ; PILE-DRIVING SHOE ; PILE PLACEMENT

3890794 METHOD OF REPLACING PILING  
OTHER KEYWORDS: PILE SECTION CONNECTION ; PILE, STRUCTURE CONNECTION ;  
PILE, WOOD ; STRUCTURE REPAIR

3899891 POST-TENSIONED PRESTRESSED PILE ASSEMBLY  
OTHER KEYWORDS: PILE-DRIVING SHOE ; PILE SECTION CONNECTION

3901042 REINFORCED CONCRETE PILE AND A METHOD OF MANUFACTURING SUCH A PILE  
OTHER KEYWORDS: PILE SECTION CONNECTION

3927533 UNDERWATER WALL STRUCTURE  
OTHER KEYWORDS: BAR PROTECTION ; BREAKWATER, CONCRETE ; GROIN ;  
PILE, SHEET

3930373 REINFORCED CONCRETE PILE AND A METHOD OF MANUFACTURING SUCH A PILE

3931716 PILE SPLICE FOR CONCRETE AND STEEL PILES OF VARIOUS CONFIGURATION  
OTHER KEYWORDS: PILE SECTION CONNECTION ; PILE, STEEL

3934422 PILE SPLICING APPARATUS AND METHOD  
OTHER KEYWORDS: CONCRETE FORM ; PILE, WOOD ; STRUCTURE REPAIR

- 3953981 CONNECTING COMPONENTS FOR PILES  
OTHER KEYWORDS: PILE SECTION CONNECTION
- 3961491 PILE CONNECTING DEVICE  
OTHER KEYWORDS: PILE SECTION CONNECTION
- 3984989 MEANS FOR PRODUCING SUBAQUEOUS AND OTHER CAST-IN-PLACE CONCRETE  
STRUCTURES IN SITU. OTHER KEYWORDS: BREAKWATER, CONCRETE ;  
CONCRETE FORM ; FABRIC MAT ; OFFSHORE CONSTRUCTION ; SEAWALL ;  
STRUCTURE REPAIR
- 3988899 PILE JOINER FOR CONNECTING THE ENDS OF CONCRETE PILES  
AND ITS MEMBERS. OTHER KEYWORDS: PILE SECTION CONNECTION
- 3995438 METHOD FOR INCREASING THE LOAD CARRYING CAPACITY AND  
PULL-OUT RESISTANCE OF HOLLOW PILES. OTHER KEYWORDS:  
EMBEDMENT ANCHOR ; PILE, SHEET

PILE, SHEET

- 3822557 JET SHEET AND CIRCULAR PILE WITH WATER HAMMER ASSIST  
OTHER KEYWORDS: PILE DRIVER, VIBRATORY ; PILE DRIVER, WATER JET ;  
PILE-DRIVING SHOE ; PILE, STEEL
- 3828563 METHOD AND APPARATUS FOR TIGHTENING THE WATER-SUBMERGED JOINTS  
BETWEEN WALL-FORMING ELEMENTS. OTHER KEYWORDS:  
PILE SECTION CONNECTION ; PILE, STEEL
- 3871181 METHOD OF FORMING AN ENCLOSURE IN A BODY OF WATER  
OTHER KEYWORDS: COFFERDAM ; OFFSHORE CONSTRUCTION ;  
OFFSHORE PLATFORM, JACK UP ; OFFSHORE STORAGE TANK, EMERGENT ;  
PILE, STEEL
- 3889482 JET SHEET AND CIRCULAR PILE WITH WATER HAMMER ASSIST  
OTHER KEYWORDS: PILE DRIVER, VIBRATORY ; PILE DRIVER, WATER JET ;  
PILE-DRIVING SHOE ; PILE, STEEL
- 3927533 UNDERWATER WALL STRUCTURE  
OTHER KEYWORDS: BAR PROTECTION ; BREAKWATER, CONCRETE ; GROIN ;  
PILE, CONCRETE
- 3995438 METHOD FOR INCREASING THE LOAD CARRYING CAPACITY  
AND PULL-OUT RESISTANCE OF HOLLOW PILES. OTHER KEYWORDS:  
EMBEDMENT ANCHOR ; PILE, CONCRETE

PILE, STEEL

- 3791154 MOORING STRUCTURE AND METHOD  
OTHER KEYWORDS: OFFSHORE MOORING STRUCTURE ; PILE, CONCRETE ;  
PILE DOLPHIN ; PILE SECTION CONNECTION
- 3796056 H-PILE COMBINATION WITH PROJECTING PLATE MEANS
- 3796057 PILE SPLICER WITH RETAINING MEANS  
OTHER KEYWORDS: PILE SECTION CONNECTION
- 3798867 STRUCTURAL METHOD AND APPARATUS  
OTHER KEYWORDS: CONCRETE FORM ; STRUCTURE REPAIR
- 3802205 SEA WALL CONSTRUCTION  
OTHER KEYWORDS: CONCRETE BLOCK ; SEAWALL
- 3810363 PILE WITH REINFORCED LEADING END  
OTHER KEYWORDS: PILE-DRIVING SHOE

- 3817040 PILE DRIVING METHOD  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE DRIVER, WATER JET ;  
SEABED FOUNDATION ; PILE FOOTING
- 3822557 JET SHEET AND CIRCULAR PILE WITH WATER HAMMER ASSIST  
OTHER KEYWORDS: PILE DRIVER, VIBRATORY ; PILE DRIVER, WATER JET ;  
PILE-DRIVING SHOE ; PILE, SHEET
- 3828563 METHOD AND APPARATUS FOR TIGHTENING THE WATER-SUBMERGED JOINTS  
BETWEEN WALL-FORMING ELEMENTS. OTHER KEYWORDS:  
PILE SECTION CONNECTION ; PILE, SHEET
- 3834168 SLIP-JOINTED PILE AND DOLPHIN CONSTRUCTION  
OTHER KEYWORDS: PILE DOLPHIN ; PILE SECTION CONNECTION
- 3851490 CONSTRUCTION PILE HAVING FLUID INJECTION MEANS  
OTHER KEYWORDS: PILE DRIVER, WATER JET
- 3852968 TORSION-MODE BREASTING DOLPHIN  
OTHER KEYWORDS: PILE DOLPHIN
- 3852971 PILE STRUCTURE  
OTHER KEYWORDS: GROUTING ; PILE-DRIVING SHOE
- 3871181 METHOD OF FORMING AN ENCLOSURE IN A BODY OF WATER  
OTHER KEYWORDS: COFFERDAM ; OFFSHORE CONSTRUCTION ;  
OFFSHORE PLATFORM, JACK UP ; OFFSHORE STORAGE  
TANK, EMERGENT ; PILE, SHEET
- 3874179 SUBMARINE OIL STORAGE TANK SYSTEM  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, SUBMERGED
- 3874181 HIGH LOAD CARRYING CAPACITY, FREEZE AND CRACK-PROOF  
CONCRETE METAL PILE. OTHER KEYWORDS: EMBEDMENT ANCHOR ;  
ICE PROTECTION ; PILE, CONCRETE
- 3889482 JET SHEET AND CIRCULAR PILE WITH WATER HAMMER ASSIST  
OTHER KEYWORDS: PILE DRIVER, VIBRATORY ; PILE DRIVER, WATER JET ;  
PILE-DRIVING SHOE ; PILE, SHEET
- 3890795 KIT OF COMPONENTS AND A METHOD OF PROTECTING STEEL PILING  
OTHER KEYWORDS: COATING ; CORROSION PREVENTION  
FROM CORROSION
- 3891845 WET ENVIRONMENT RADIOGRAPHY APPARATUS  
OTHER KEYWORDS: INSTRUMENT, RADIOISOTOPE ; STRUCTURE INSPECTION
- 3895471 METHOD AND APPARATUS FOR FORMING ELONGATED BATTER PILING IN SITU  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE PLACEMENT ;  
PILE SECTION CONNECTION
- 3924413 FITTINGS AND THE LIKE FOR PIPE PILING  
OTHER KEYWORDS: PILE-DRIVING SHOE ; PILE SECTION CONNECTION
- 3931716 PILE SPLICE FOR CONCRETE AND STEEL PILES OF VARIOUS CONFIGURATION  
OTHER KEYWORDS: PILE, CONCRETE ; PILE SECTION CONNECTION
- 3939664 LARGE DIAMETER TUBULAR PILES AND THE BEDDING THEREOF  
OTHER KEYWORDS: GROUTING ; PILE FOOTING ; SEABED FOUNDATION
- 3939665 METHOD FOR PROTECTING METAL H-PILING IN UNDERWATER ENVIRONMENTS  
AND PROTECTED H-PILING. OTHER KEYWORDS: COATING ; CORROSION PREVENTION

3996757 APPARATUS FOR PROTECTING METALLIC STRUCTURAL ELEMENTS  
AGAINST CORROSION. OTHER KEYWORDS: COATING ; CORROSION PREVENTION ;  
PILE PROTECTION

PILE, STRUCTURE CONNECTION

3797258 SHIM TAKE-UP RING FOR PILE CONNECTION  
OTHER KEYWORDS: OFFSHORE PLATFORM, LEG

3811289 METHODS OF GROUTING OFFSHORE STRUCTURES  
OTHER KEYWORDS: GROUTING ; OFFSHORE CONSTRUCTION

3832857 PRESSURE GROUTING  
OTHER KEYWORDS: GROUTING ; SEABED FOUNDATION

3838575 METHOD OF GROUTING OFFSHORE STRUCTURE  
OTHER KEYWORDS: GROUTING

3839872 METHOD OF SECURING A LARGE-DIAMETER TUBE TO A CASING UNDERWATER  
OTHER KEYWORDS: GROUTING

3878687 GROUTING OF OFFSHORE STRUCTURES  
OTHER KEYWORDS: GROUTING ; OFFSHORE PLATFORM, LEG

3890794 METHOD OF REPLACING PILING  
OTHER KEYWORDS: PILE, CONCRETE ; PILE SECTION CONNECTION ;  
PILE, WOOD ; STRUCTURE REPAIR

3948056 MODULAR OFFSHORE STRUCTURE SYSTEM  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, LEG ;  
PILE PLACEMENT

3967456 SEALING DEVICES  
OTHER KEYWORDS: GROUTING

3987636 METHODS AND APPARATUS FOR ANCHORING A SUBMERGED STRUCTURE  
TO A WATERBED. OTHER KEYWORDS: GROUTING ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE PLATFORM, LEG ; PILE FOOTING ; SEABED FOUNDATION

RE28232 METHODS OF GROUTING OFFSHORE STRUCTURES  
OTHER KEYWORDS: GROUTING ; OFFSHORE CONSTRUCTION

PILE, WOOD

3802206 PILE SPLICER  
OTHER KEYWORDS: PILE SECTION CONNECTION

3890794 METHOD OF REPLACING PILING  
OTHER KEYWORDS: PILE, CONCRETE ; PILE SECTION CONNECTION ;  
PILE, STRUCTURE CONNECTION ; STRUCTURE REPAIR

3934422 PILE SPLICING APPARATUS AND METHOD  
OTHER KEYWORDS: CONCRETE FORM ; PILE, CONCRETE ; STRUCTURE REPAIR

3999399 PROTECTIVE GUARD MEANS FOR WOOD PILING AND A METHOD  
OF INSTALLING SAME UNDER DRY WORKING CONDITIONS  
OTHER KEYWORDS: COATING ; COLLISION PROTECTION ; FOULING PREVENTION ;  
PIER FENDER ; PILE PROTECTION

POLLUTANT ABSORPTION

3783129 METHOD OF AND APPARATUS FOR THE RECOVERY OF OIL FROM WATER  
OTHER KEYWORDS: POLLUTANT, MECHANICAL REMOVAL ;  
POLLUTANT REMOVAL WATERCRAFT

3783621 CONVERTIBLE BARRIER FOR SUBSTANCES FLOATING ON WATER  
 OTHER KEYWORDS: POLLUTANT, SURFACE BARRIER

3785972 CONTAINING AND REMOVING OIL SPILLS ON WATER  
 OTHER KEYWORDS: POLLUTANT, SURFACE BARRIER

3788984 METHOD OF REMOVING OIL SPILLS

3791990 OIL ABSORBENT

3795315 CONTROL OF WATERBORNE OIL SLICKS  
 OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT, SURFACE BARRIER

3800950 APPARATUS FOR REMOVING OIL FROM WATER  
 OTHER KEYWORDS: POLLUTANT, MECHANICAL REMOVAL

3812968 DEVICE FOR RECOVERING FLOATING MATTER FROM WATER SURFACE  
 OTHER KEYWORDS: POLLUTANT, MECHANICAL REMOVAL ;  
 POLLUTANT REMOVAL WATERCRAFT ; POLLUTANT, SUCTION REMOVAL

3812973 COMPOSITION OF MATTER FOR CONTROLLING OIL POLLUTION  
 AND PREFERABLY OIL DISCHARGE IN WATER

3819514 OIL SPILL RECOVERY

3835049 OIL SPILL CONTROL

3843517 METHODS FOR ELIMINATION OF OIL SLICKS

3844941 USE OF SULFUR FOR COMEATING OIL SPILLS  
 OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT, SURFACE BARRIER

3855152 PREPARATION OF PERLITE-ASPHALT-FIBER COMPOSITIONS  
 FOR SEPARATING HYDROCARBONS FROM WATER

3869385 PROCESS FOR CONTAINING OIL SPILLS  
 OTHER KEYWORDS: POLLUTANT, SURFACE BARRIER

3886067 PROCESS FOR CONTROLLING OIL SLICKS  
 OTHER-KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3886070 METHOD FOR COMEATING POLLUTION USING A CHROMIUM COMPLEX

3888766 OIL SORPTION MATERIAL

3890224 PROCESS FOR CONTROLLING SURFACE POLLUTANTS

3904528 PICK-UP ELEMENT FOR OIL CONTAMINANTS

3917528 FORAMINOUS COMPOSITION FOR REMOVAL OF OLEOPHILIC MATERIAL  
 FROM THE SURFACE OF WATER

3928205 REMOVAL OF FLOATING POLLUTANTS  
 OTHER KEYWORDS: POLLUTANT, MECHANICAL REMOVAL

3929631 COMPOSITIONS AND SYSTEMS TO RECOVER OILS FROM AQUEOUS  
 AND SOLID SURFACES

3933632 REMOVAL OF IMMISCIBLE FLUIDS FROM WATER SURFACES AND LAKE BEDS

3959134 OIL COLLECTION AGENTS AND THEIR USE IN CONTAINING OIL SLICKS

3960722 OIL ADSORBENT  
 OTHER KEYWORDS: POLLUTANT, MECHANICAL REMOVAL



3962083 APPARATUS AND METHOD FOR PROTECTING A SHORELINE  
AGAINST CONTAMINATION FROM AN OIL SPILL  
OTHER KEYWORDS: FABRIC MAT ; POLLUTANT, MECHANICAL REMOVAL ;  
WAVE ABSORBER BEACH

3966597 OIL OR ORGANIC SOLVENT-ABSORBENT

3976570 METHOD AND APPARATUS FOR REMOVING CONTAMINANTS FROM THE SURFACE  
OF A BODY OF WATER. OTHER KEYWORDS: POLLUTANT COLLECTION ;  
POLLUTANT, MECHANICAL REMOVAL

3977969 CONTAINMENT AND RIDDANCE OF OIL SPILLS

3986959 OIL SPILL APPARATUS  
OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT REMOVAL WATERCRAFT ;  
POLLUTANT, SUCTION REMOVAL

3990970 ABSORBENT PRODUCTS FOR HYDROCARBONS

3990975 RIGGING SYSTEM FOR AN ENDLESS OIL MOP  
OTHER KEYWORDS: POLLUTANT, MECHANICAL REMOVAL

3998060 BARRIER FOR WATER CARRIED POLLUTANTS  
OTHER KEYWORDS: POLLUTANT, SURFACE BARRIER

POLLUTANT COALESCENCE

3810835 PROCESS FOR TREATING OIL SLICKS USING CHEMICAL AGENTS  
OTHER KEYWORDS: POLLUTANT COLLECTION

3821109 METHOD FOR THE CONTROL OF OILS FLOATING ON WATER

3865722 CORONA DISCHARGE TREATMENT OF AN OIL SLICK

3919083 TREATMENT OF FLOATING POLLUTANTS

3941694 PROCESS FOR REDUCING THE ADHERENCE OF OIL TO SILICEOUS MATERIAL

POLLUTANT COLLECTION

3785159 ATTENUATION OF WATER WAVES AND CONTROL AND UTILIZATION  
OF WAVE-INDUCED WATER MOVEMENTS. OTHER KEYWORDS: BREAKWATER, FLOATING ;  
BREAKWATER, STEEL FRAME ; POLLUTANT DISPERSION ;  
POLLUTANT, SURFACE BARRIER ; POWER, WAVE

3785496 OIL RECLAIMING DEVICE FOR REMOVING OIL FROM THE SURFACE OF WATER  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT ;  
POLLUTANT, SUCTION REMOVAL

3788079 METHOD AND APPARATUS FOR COLLECTING A FLOATING LIQUID  
OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL ;  
POLLUTANT, SURFACE BARRIER

3795315 CONTROL OF WATERBORNE OIL SLICKS  
OTHER KEYWORDS: POLLUTANT ABSORPTION ; POLLUTANT, SURFACE BARRIER

3796656 OIL SLICK REMOVAL METHOD; SYSTEM AND BAG THEREFOR  
OTHER KEYWORDS: POLLUTANT, MECHANICAL REMOVAL

3800542 FLOATING BOOM  
OTHER KEYWORDS: POLLUTANT DEBRIS ; POLLUTANT, SURFACE BARRIER

3803848 BOOM ARRANGEMENT FOR CONFINING OIL  
OTHER KEYWORDS: POLLUTANT, SURFACE BARRIER

3804251 FLOATAGE COLLECTING APPARATUS AND METHOD  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3810835 PROCESS FOR TREATING OIL SLICKS USING CHEMICAL AGENTS  
OTHER KEYWORDS: POLLUTANT COALESCENCE

3811325 APPARATUS FOR COLLECTING SURFACE PARTICLES ON BODY OF WATER  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ; SAMPLER, SURFACE

3815751 OIL/WATER SEPARATION AND RECOVERY SYSTEM  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT ;  
POLLUTANT, SUCTION REMOVAL ; POLLUTANT, SURFACE BARRIER

3820488 UNDERWATER SEWAGE COLLECTION SYSTEM FOR DOCKED BOATS  
OTHER KEYWORDS: SMALL-CRAFT SERVICE STRUCTURE

3822789 OIL SKIMMER MODULE WITH FREE FLOATING WEIR TROUGH  
OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL

3823828 PROPELLING ARRANGEMENT FOR OIL AND GARBAGE SKIMMER CRAFT  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3844122 PROTECTED OFFSHORE STORAGE FACILITY  
OTHER KEYWORDS: BREAKWATER, CONCRETE ;  
OFFSHORE STORAGE TANK, EMERGENT

3844941 USE OF SULPHUR FOR COMBATING OIL SPILLS  
OTHER KEYWORDS: POLLUTANT ADSORPTION ; POLLUTANT, SURFACE BARRIER

3847815 SCOOP FOR COLLECTING A LAYER OF POLLUTING MATERIAL  
ON WATER SURFACES. OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL

3847816 POLLUTION SUCTION WATER SWEEPER  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT ;  
POLLUTANT, SUCTION REMOVAL

3852965 FLOTATION TYPE WATER SWEEP BOOM AND METHODS  
OTHER KEYWORDS: POLLUTANT, SURFACE BARRIER

3862902 DEVICE FOR RECEIVING WATER SURFACE FLOATING IMPURITIES  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3862904 BOAT FOR COLLECTING OIL SLICKS AND OTHER CONTAMINANTS  
FROM THE SURFACE OF WATER. OTHER KEYWORDS: POLLUTANT DEBRIS ;  
POLLUTANT REMOVAL WATERCRAFT ; POLLUTANT, SUCTION REMOVAL ;  
POLLUTANT, SURFACE BARRIER

3867817 OIL FENCE HAVING A LIMITED FLEXIBILITY  
OTHER KEYWORDS: POLLUTANT, SURFACE BARRIER

3868824 MODULAR OIL CONTAINMENT BOOM  
OTHER KEYWORDS: POLLUTANT, SURFACE BARRIER

3875062 DEVICE FOR CLEANING WATER POLLUTED BY OIL  
OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL

3883433 COLLECTION AND RECOVERY SYSTEM FOR OIL SPILLS  
OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL

3884807 APPARATUS FOR SKIMMING IN MULTI-PHASE FLUID MEDIA  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3886750 OIL CONTAINMENT APPARATUS  
OTHER KEYWORDS: POLLUTANT, SURFACE BARRIER

3890234 OIL SEPARATION AND RECOVERY DEVICE  
OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL

3909417 DEVICE FOR DAMPING THE SURGE OF WATER WAVES PARTICULARLY  
FOR A FLOATING BODY DESIGNED TO CLEAN POLLUTED WATER  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3922862 FLOATING CONTAINING VESSELS OR DAMS FOR TRAPPING LIQUID POLLUTANTS  
OTHER KEYWORDS: POLLUTANT, SURFACE BARRIER

3926812 FLOATAGE CONCENTRATING EQUIPMENT FOR NAUTICAL FLOATAGE  
RECOVERY APPARATUS. OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT ;  
POLLUTANT, SURFACE BARRIER

3929644 WATERCRAFT FOR SCAVENGING OIL SPILLAGE  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3931740 APPARATUS FOR COLLECTING SURFACE PARTICLE ON BODY OF WATER  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ; SAMPLER, SURFACE

3936377 OIL SEPARATION AND RECOVERY METHOD  
OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL

3939663 OIL FENCE HAVING DIRECTIONAL CONTROL DEVICE  
OTHER KEYWORDS: POLLUTANT, SURFACE BARRIER

3951810 OIL SKIMMER MODULE WITH FREE FLOATING WEIR TROUGH  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT ;  
POLLUTANT, SUCTION REMOVAL

3957646 INSTALLATION FOR REMOVING POLLUTANTS FROM WATERWAYS  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3962875 OIL FENCE HAVING A LIMITED FLEXIBILITY  
OTHER KEYWORDS: POLLUTANT, SURFACE BARRIER

3963617 RETRIEVAL MEANS FOR A FLOATING LIQUID SPILLING  
OTHER KEYWORDS: POLLUTANT, SURFACE BARRIER

3966613 APPARATUS FOR SPILLING RETRIEVAL  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3966614 OIL SPILL CLEANUP SYSTEM  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT ;  
POLLUTANT, SUCTION REMOVAL

3973406 CONTAINMENT BOOM  
OTHER KEYWORDS: POLLUTANT, SURFACE BARRIER

3976570 METHOD AND APPARATUS FOR REMOVING CONTAMINANTS FROM THE SURFACE OF  
A BODY OF WATER. OTHER KEYWORDS: POLLUTANT ABSORPTION ;  
POLLUTANT, MECHANICAL REMOVAL

3979291 OIL BOOM AND METHOD OF SKIMMING FLOATING OIL FROM THE SURFACE  
OF A BODY OF WATER. OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL ;  
POLLUTANT, SURFACE BARRIER

3981154 SYSTEM FOR RECOVERING PETROLEUM FLUIDS FROM UNDERWATER FISSURES  
OTHER KEYWORDS: POLLUTANT, SUBMERGED BARRIER

3986959 OIL SPILL APPARATUS  
OTHER KEYWORDS: POLLUTANT ABSORPTION ; POLLUTANT REMOVAL WATERCRAFT ;  
POLLUTANT, SUCTION REMOVAL

3999566 METHOD AND APPARATUS FOR DISCHARGING OVERBOARD EXCESS WATER  
FROM HOPPER OF HOPPER SUCTION DREDGER OR BARGE OR SCOW  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE-SPOIL TRANSPORT ;  
HOPPER BARGE

RE28978 FAIL-SAFE SURSEA FLUID TRANSPORTATION SYSTEM  
OTHER KEYWORDS: POLLUTANT, SUBMERGED BARRIER ;  
SEABED OIL, PROCESS STRUCTURE

#### POLLUTANT DEBRIS

3800542 FLOATING BOOM  
OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT, SURFACE BARRIER

3852964 FLOATING ANTI-POLLUTION DEVICE  
OTHER KEYWORDS: POLLUTANT, SURFACE BARRIER

3862904 BOAT FOR COLLECTING OIL SLICKS AND OTHER CONTAMINANTS  
FROM THE SURFACE OF WATER. OTHER KEYWORDS: POLLUTANT COLLECTION ;  
POLLUTANT REMOVAL WATERCRAFT ; POLLUTANT, SUCTION REMOVAL ;  
POLLUTANT, SURFACE BARRIER

3928206 APPARATUS FOR THE COLLECTION OF BUOYANT FOREIGN MATTER  
OTHER KEYWORDS: POLLUTANT, MECHANICAL REMOVAL ;  
POLLUTANT REMOVAL WATERCRAFT

#### POLLUTANT DISPERSION

3785159 ATTENUATION OF WATER WAVES AND CONTROL AND UTILIZATION  
OF WAVE-INDUCED WATER MOVEMENTS. OTHER KEYWORDS:  
BREAKWATER, FLOATING ; BREAKWATER, STEEL FRAME ;  
POLLUTANT COLLECTION ; POLLUTANT, SURFACE BARRIER ; POWER, WAVE

3793218 OIL SLICK DISPERSANT AND METHOD

3959127 BIODEGRADATION OF OIL ON WATER SURFACES

3975784 MARINE STRUCTURE  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE PROPULSION ;  
OFFSHORE PLATFORM ANCHOR ; OFFSHORE PLATFORM, FLOATING ;  
SEABED PIPELINE PLACEMENT ; SEABED TRENCHER

3996134 METHOD OF DISPERSING OIL IN WATER

3998733 DETERGENT COMPOSITION FOR DISPERSING OIL SPILLS

#### POLLUTANT MEASUREMENT

3783284 METHOD AND APPARATUS FOR DETECTION OF PETROLEUM PRODUCTS  
OTHER KEYWORDS: INSTRUMENT, AIRBORNE ; INSTRUMENT, LASER

3800219 METHOD AND APPARATUS FOR DETECTING OIL POLLUTION IN WATER  
OTHER KEYWORDS: BUOY, INSTRUMENTED

3852997 METHOD AND APPARATUS FOR MONITORING POLLUTION OF NATURAL WATERS

3871228 PERMEABLE MEMBRANE GAS SATUROMETER

3885418 METHOD AND APPARATUS FOR DETECTING THE PRESENCE OF AN OIL SLICK  
ON A WATER SURFACE. OTHER KEYWORDS: BUOY, INSTRUMENTED

3899213 AIRBORNE LASER REMOTE SENSING SYSTEM FOR THE DETECTION  
AND IDENTIFICATION OF OIL SPILLS. OTHER KEYWORDS:  
INSTRUMENT, AIRBORNE ; INSTRUMENT, LASER

3911384 WATER QUALITY DETERMINATION APPARATUS

3914674 OIL-SPILL DETECTION SYSTEM  
OTHER KEYWORDS: BUOY, INSTRUMENTED ; POLLUTANT, MECHANICAL REMOVAL

3955421 PERIPHYTON SAMPLER FOR WATER QUALITY MONITORING  
OTHER KEYWORDS: SAMPLER, BIOTA

3988932 OIL SLICK SAMPLING APPARATUS AND METHOD  
OTHER KEYWORDS: SAMPLER, SURFACE

POLLUTANT REMOVAL WATERCRAFT

3783129 METHOD OF AND APPARATUS FOR THE RECOVERY OF OIL FROM WATER  
OTHER KEYWORDS: POLLUTANT ABSORPTION ; POLLUTANT, MECHANICAL REMOVAL

3785496 OIL RECLAIMING DEVICE FOR REMOVING OIL FROM THE SURFACE OF WATER  
OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT, SUCTION REMOVAL

3788481 METHOD FOR THE ELIMINATION AND POSSIBLE RECOVERY  
OF THE FLOATING POLLUTING SUBSTANCES; MINERAL OILS  
IN PARTICULAR, FROM SHEETS OF WATER AND BOAT FITTED TO THIS AIM  
OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL

3789988 APPARATUS FOR REMOVING SURFACE POLLUTANTS FROM WATER  
AND OTHER LIQUIDS. OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL

3794175 OIL RECOVERY APPARATUS  
OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL

3800951 APPARATUS FOR REMOVING A SUBSTANCE FLOATING AS A LAYER  
ON THE SURFACE OF A BODY OF LIQUID. OTHER KEYWORDS:  
POLLUTANT, SUCTION REMOVAL

3804251 FLOATAGE COLLECTING APPARATUS AND METHOD  
OTHER KEYWORDS: POLLUTANT COLLECTION

3812968 DEVICE FOR RECOVERING FLOATING MATTER FROM WATER SURFACE  
OTHER KEYWORDS: POLLUTANT ABSORPTION ; POLLUTANT, MECHANICAL REMOVAL ;  
POLLUTANT, SUCTION REMOVAL

3815751 OIL/WATER SEPARATION AND RECOVERY SYSTEM  
OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT, SUCTION REMOVAL ;  
POLLUTANT, SURFACE BARRIER

3823828 PROPELLING ARRANGEMENT FOR OIL AND GARBAGE SKIMMER CRAFT  
OTHER KEYWORDS: POLLUTANT COLLECTION

3844944 APPARATUS AND METHODS FOR EFFECTING SEPARATIONS

3847816 POLLUTION SUCTION WATER SWEEPER  
OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT, SUCTION REMOVAL

3860519 OIL SLICK SKIMMER  
OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL

3862537 MECHANICAL ELIMINATION OF AQUATIC GROWTHS  
OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL ; WATER PLANT REMOVAL

3862902 DEVICE FOR RECEIVING WATER SURFACE FLOATING IMPURITIES  
OTHER KEYWORDS: POLLUTANT COLLECTION

3862904 BOAT FOR COLLECTING OIL SLICKS AND OTHER CONTAMINANTS  
FROM THE SURFACE OF WATER. OTHER KEYWORDS: POLLUTANT COLLECTION ;  
POLLUTANT DEBRIS ; POLLUTANT, SUCTION REMOVAL ;  
POLLUTANT, SURFACE BARRIER

3884807 APPARATUS FOR SKIMMING IN MULTI-PHASE FLUID MEDIA  
OTHER KEYWORDS: POLLUTANT COLLECTION

3886067 PROCESS FOR CONTROLLING OIL SLICKS  
OTHER KEYWORDS: POLLUTANT ABSORPTION

3907685 BELT DEVICE FOR COLLECTING FLOATING MATTER FROM WATER SURFACE  
OTHER KEYWORDS: POLLUTANT, MECHANICAL REMOVAL

3909416 METHOD AND APPARATUS FOR SEPARATING LIQUIDS OF DIFFERENT SPECIFIC GRAVITIES FROM A MIXTURE OF THE SAME. OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL

3909417 DEVICE FOR DAMPING THE SURGE OF WATER WAVES PARTICULARLY FOR A FLOATING BODY DESIGNED TO CLEAN POLLUTED WATER  
OTHER KEYWORDS: POLLUTANT COLLECTION

3915864 VESSEL FOR REMOVING LIQUID CONTAMINANTS FROM THE SURFACE OF A WATER BODY. OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL

3922225 SEA-WATER OIL SPILL CLEANING SYSTEM  
OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL

3923661 OIL SKIMMER WITH LEAD FLOAT AND HINGED WEIR  
OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL

3926812 FLOATAGE CONCENTRATING EQUIPMENT FOR NAUTICAL FLOATAGE RECOVERY APPARATUS. OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT, SURFACE BARRIER

3928206 APPARATUS FOR THE COLLECTION OF BUOYANT FOREIGN MATTER  
OTHER KEYWORDS: POLLUTANT DEBRIS ; POLLUTANT, MECHANICAL REMOVAL

3929644 WATERCRAFT FOR SCAVENGING OIL SPILLAGE  
OTHER KEYWORDS: POLLUTANT COLLECTION

3947360 ENVIRONMENT PROTECTIVE OIL SKIMMING AND REMOVAL APPARATUS  
OTHER KEYWORDS: POLLUTANT, MECHANICAL REMOVAL

3951810 OIL SKIMMER MODULE WITH FREE FLOATING WEIR TROUGH  
OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT, SUCTION REMOVAL

3957646 INSTALLATION FOR REMOVING POLLUTANTS FROM WATERWAYS  
OTHER KEYWORDS: POLLUTANT COLLECTION

3959136 OIL SPILL CLEANUP METHOD AND APPARATUS  
OTHER KEYWORDS: POLLUTANT, MECHANICAL REMOVAL

3966613 APPARATUS FOR SPILLING RETRIEVAL  
OTHER KEYWORDS: POLLUTANT COLLECTION

1966614 OIL SPILL CLEANUP SYSTEM  
OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT, SUCTION REMOVAL

3966615 OIL COLLECTION BARGE  
OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL

3968041 APPARATUS FOR COLLECTING OIL SLICK FROM A BODY OF WATER  
OTHER KEYWORDS: POLLUTANT, MECHANICAL REMOVAL

3971720 OIL FENCE  
OTHER KEYWORDS: POLLUTANT, SURFACE BARRIER

3980559 METHOD AND AN APPARATUS FOR COLLECTING SUBSTANCES AND OBJECTS ON A LIQUID SURFACE. OTHER KEYWORDS: POLLUTANT, MECHANICAL REMOVAL

3986959 OIL SPILL APPARATUS  
OTHER KEYWORDS: POLLUTANT ABSORPTION ; POLLUTANT COLLECTION ; POLLUTANT, SUCTION REMOVAL

3992292 MOVING BELT-TYPE OIL SKINNER WITH PROPULSION INDUCED FLOW;  
METHOD AND APPARATUS. OTHER KEYWORDS: POLLUTANT, MECHANICAL REMOVAL  
POLLUTANT, MECHANICAL REMOVAL

3783129 METHOD OF AND APPARATUS FOR THE RECOVERY OF OIL FROM WATER  
OTHER KEYWORDS: POLLUTANT ABSORPTION ; POLLUTANT REMOVAL WATERCRAFT

3796656 OIL SLICK REMOVAL METHOD, SYSTEM AND BAG THEREFOR  
OTHER KEYWORDS: POLLUTANT COLLECTION

3800950 APPARATUS FOR REMOVING OIL FROM WATER  
OTHER KEYWORDS: POLLUTANT ABSORPTION

3812968 DEVICE FOR RECOVERING FLOATING MATTER FROM WATER SURFACE  
OTHER KEYWORDS: POLLUTANT ABSORPTION ; POLLUTANT REMOVAL WATERCRAFT ;  
POLLUTANT, SUCTION REMOVAL

3817385 METHOD AND A DEVICE FOR COLLECTING SUBSTANCES FLOATING  
IN A LIQUID SURFACE

3838775 DEVICE FOR COLLECTING LOOSE MATERIAL FROM A SURFACE,  
PARTICULARLY OIL FLOATING ON WATER

3865730 OIL SPILL CLEANUP

3905902 RECOVERY OF OIL AND OIL-SOLUBLE CONTAMINANTS  
FROM THE SURFACE OF WATER

3907685 BELT DEVICE FOR COLLECTING FLOATING MATTER FROM WATER SURFACE  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3912635 DEVICE FOR RECOVERING POLLUTING PRODUCTS SPREAD  
OVER THE WATER SURFACE, IN PARTICULAR OIL PRODUCTS

3916674 OIL-SPILL DETECTION SYSTEM  
OTHER KEYWORDS: BUOY, INSTRUMENTED ; POLLUTANT MEASUREMENT

3928205 REMOVAL OF FLOATING POLLUTANTS  
OTHER KEYWORDS: POLLUTANT ABSORPTION

3928206 APPARATUS FOR THE COLLECTION OF BUOYANT FOREIGN MATTER  
OTHER KEYWORDS: POLLUTANT DEBRIS ; POLLUTANT REMOVAL WATERCRAFT

3947360 ENVIRONMENT PROTECTIVE OIL SKIMMING AND REMOVAL APPARATUS  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3959136 OIL SPILL CLEANUP METHOD AND APPARATUS  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3960722 OIL ADSORBENT  
OTHER KEYWORDS: POLLUTANT ABSORPTION

3962083 APPARATUS AND METHOD FOR PROTECTING A SHORELINE  
AGAINST CONTAMINATION FROM AN OIL SPILL. OTHER KEYWORDS: FABRIC MAT ;  
POLLUTANT ABSORPTION ; WAVE ABSORBER BEACH

3968041 APPARATUS FOR COLLECTING OIL SLICK FROM A BODY OF WATER  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3976570 METHOD AND APPARATUS FOR REMOVING CONTAMINANTS FROM THE SURFACE  
OF A BODY OF WATER. OTHER KEYWORDS: POLLUTANT ABSORPTION ;  
POLLUTANT COLLECTION

3980559 METHOD AND AN APPARATUS FOR COLLECTING SUBSTANCES AND OBJECTS  
ON A LIQUID SURFACE.OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3990975 RIGGING SYSTEM FOR AN ENDLESS OIL MOP  
OTHER KEYWORDS: POLLUTANT ABSORPTION

3992292 MOVING BELT-TYPE OIL SKIMMER WITH PROPULSION INDUCED FLOW,  
METHOD AND APPARATUS.OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

POLLUTANT, SUBMERGED BARRIER

3879951 UNDERWATER DRILLING POLLUTION CONTROL CURTAIN

3981154 SYSTEM FOR RECOVERING PETROLEUM FLUIDS FROM UNDERWATER FISSURES  
OTHER KEYWORDS: POLLUTANT COLLECTION

3984987 SILT AND POLLUTION CONTROL FOR MARINE FACILITY  
OTHER KEYWORDS: CHANNEL PROTECTION ; PIER, FIXED ;  
POLLUTANT, SURFACE BARRIER

RE28978 FAIL-SAFE SUBSEA FLUID TRANSPORTATION SYSTEM  
OTHER KEYWORDS: POLLUTANT COLLECTION ; SEABED OIL, PROCESS STRUCTURE

POLLUTANT SUCTION REMOVAL

3782553 LIGHT LIQUID SKIMMER

3784013 MULTI-UNIT APPARATUS FOR COLLECTING OIL FROM THE SURFACE  
OF A BODY OF WATER

3785496 OIL RECLAIMING DEVICE FOR REMOVING OIL FROM THE SURFACE OF WATER  
OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT REMOVAL WATERCRAFT

3788079 METHOD AND APPARATUS FOR COLLECTING A FLOATING LIQUID  
OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT, SURFACE BARRIER

3788481 METHOD FOR THE ELIMINATION AND POSSIBLE RECOVERY OF THE FLOATING  
POLLUTING SUBSTANCES, MINERAL OILS IN PARTICULAR, FROM SHEETS OF  
WATER AND BOAT FITTED TO THIS AIM.OTHER KEYWORDS:  
POLLUTANT REMOVAL WATERCRAFT

3789988 APPARATUS FOR REMOVING SURFACE POLLUTANTS FROM WATER  
AND OTHER LIQUIDS.OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3794175 OIL RECOVERY APPARATUS  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3800951 APPARATUS FOR REMOVING A SUBSTANCE FLOATING AS A LAYER  
ON THE SURFACE OF A BODY OF LIQUID.OTHER KEYWORDS:  
POLLUTANT REMOVAL WATERCRAFT

3812968 DEVICE FOR RECOVERING FLOATING MATTER FROM WATER SURFACE  
OTHER KEYWORDS: POLLUTANT ABSORPTION ; POLLUTANT, MECHANICAL REMOVAL ;  
POLLUTANT REMOVAL WATERCRAFT

3815751 OIL/WATER SEPARATION AND RECOVERY SYSTEM  
OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT REMOVAL WATERCRAFT ;  
POLLUTANT, SURFACE BARRIER

3822789 OIL SKIMMER MODULE WITH FREE FLOATING WEIR TROUGH  
OTHER KEYWORDS: POLLUTANT COLLECTION

3830370 MOTION DECOUPLED SKIMMER FOR REMOVING OIL FROM THE SURFACE  
OF CALM OR DISTURBED WATER.OTHER KEYWORDS: PUMP



3831756 SURFACE TENSION METHOD OF AND APPARATUS  
FOR SEPARATING IMMISCIBLE LIQUIDS

3836004 APPARATUS FOR RECOVERING OIL SUBSTANCES FROM THE SURFACE  
OF A BODY OF WATER

3847815 SCOOP FOR COLLECTING A LAYER OF POLLUTING MATERIAL ON WATER SURFACES  
OTHER KEYWORDS: POLLUTANT COLLECTION

3847816 POLLUTION SUCTION WATER SWEEPER  
OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT REMOVAL WATERCRAFT

3860519 OIL SLICK SKIMMER  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3862537 MECHANICAL ELIMINATION OF AQUATIC GROWTHS  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT ; WATER PLANT REMOVAL

3862904 BOAT FOR COLLECTING OIL SLICKS AND OTHER CONTAMINANTS  
FROM THE SURFACE OF WATER. OTHER KEYWORDS: POLLUTANT COLLECTION ;  
POLLUTANT DEBRIS ; POLLUTANT REMOVAL WATERCRAFT ;  
POLLUTANT, SURFACE BARRIER

3875062 DEVICE FOR CLEANING WATER POLLUTED BY OIL  
OTHER KEYWORDS: POLLUTANT COLLECTION

3880758 OIL COLLECTION DEVICE  
OTHER KEYWORDS: PUMP

3883433 COLLECTION AND RECOVERY SYSTEM FOR OIL SPILLS  
OTHER KEYWORDS: POLLUTANT COLLECTION

3890234 OIL SEPARATION AND RECOVERY DEVICE  
OTHER KEYWORDS: POLLUTANT COLLECTION

3907684 ROTARY OIL RECOVERY DEVICE WITH NON-INTEGRAL COLLECTING HEAD

3909416 METHOD AND APPARATUS FOR SEPARATING LIQUIDS OF DIFFERENT SPECIFIC  
GRAVITIES FROM A MIXTURE OF THE SAME. OTHER KEYWORDS:  
POLLUTANT REMOVAL WATERCRAFT

3915864 VESSEL FOR REMOVING LIQUID CONTAMINANTS FROM THE SURFACE  
OF A WATER BODY. OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3922225 SEA-WATER OIL SPILL CLEANING SYSTEM  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3923661 OIL SKIMMER WITH LEAD FLOAT AND HINGED WEIR  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3936377 OIL SEPARATION AND RECOVERY METHOD  
OTHER KEYWORDS: POLLUTANT COLLECTION

3951810 OIL SKIMMER MODULE WITH FREE FLOATING WEIR TROUGH  
OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT REMOVAL WATERCRAFT

3958521 DEEP SEA TANK AND SEAPORT SYSTEM  
OTHER KEYWORDS: OFFSHORE MOORING STRUCTURE ;  
OFFSHORE PLATFORM, FIXED ; POLLUTANT, SURFACE BARRIER

3966614 OIL SPILL CLEANUP SYSTEM  
OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT REMOVAL WATERCRAFT

3966615 OIL COLLECTION BARGE  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3979291 OIL BOOM AND METHOD OF SKIMMING FLOATING OIL FROM THE SURFACE  
OF A BODY OF WATER, OTHER KEYWORDS: POLLUTANT COLLECTION ;  
POLLUTANT SURFACE BARRIER

3983034 APPARATUS AND METHOD OF REMOVING DEBRIS FLOATING ON A BODY OF WATER

3986959 OIL SPILL APPARATUS  
OTHER KEYWORDS: POLLUTANT ABSORPTION ; POLLUTANT COLLECTION ;  
POLLUTANT REMOVAL WATERCRAFT

POLLUTANT, SURFACE BARRIER

3783621 CONVERTIBLE BARRIER FOR SUBSTANCES FLOATING ON WATER  
OTHER KEYWORDS: POLLUTANT ABSORPTION

3783622 METHOD AND SYSTEM FOR THE CONTAINMENT AND SALVAGE OF CHEMICALS  
AND OILS AT SEA

3785159 ATTENUATION OF WATER WAVES AND CONTROL AND UTILIZATION  
OF WAVE-INDUCED WATER MOVEMENTS, OTHER KEYWORDS: BREAKWATER, FLOATING ;  
BREAKWATER, STEEL FRAME ; POLLUTANT COLLECTION ; POLLUTANT  
DISPERSION ; POWER, WAVE

3785972 CONTAINING AND REMOVING OIL SPILLS ON WATER  
OTHER KEYWORDS: POLLUTANT ABSORPTION

3786637 OIL FENCE

3788079 METHOD AND APPARATUS FOR COLLECTING A FLOATING LIQUID  
OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT, SUCTION REMOVAL

3792589 FLOATING BARRIER

3795315 CONTROL OF WATERBORNE OIL SLICKS  
OTHER KEYWORDS: POLLUTANT ABSORPTION ; POLLUTANT COLLECTION

3798911 FLOATABLE BOOM STRUCTURE

3800542 FLOATING BOOM  
OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT DEBRIS

3802201 ROUGH WATER BARRIER

3803848 BOOM ARRANGEMENT FOR CONFINING OIL  
OTHER KEYWORDS: POLLUTANT COLLECTION

3807177 FLOATING BOOM STRUCTURES

3807178 FLOATING BOOM

3811285 FLOATING ANTI-POLLUTION BARRIER DEVICE

3815751 OIL/WATER SEPARATION AND RECOVERY SYSTEM  
OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT REMOVAL WATERCRAFT ;  
POLLUTANT, SUCTION REMOVAL

3818708 FLOATING BARRIER

3839869 BOOM AS A BARRIER FOR OIL SLICKS AND THE LIKE ON THE SURFACE OF WATER

3839870 OFF-SHORE OIL WELL LEAKAGE CONFINER

3844941 USE OF SULFUR FOR COMBATING OIL SPILLS  
OTHER KEYWORDS: POLLUTANT ABSORPTION ; POLLUTANT COLLECTION

3848417 SELF-RIGHTING FLOATING BOOMS

3849989 INFLATABLE BARRIER FOR SUBSTANCES FLOATING ON WATER

3852964 FLOATING ANTI-POLLUTION DEVICE  
OTHER KEYWORDS: POLLUTANT DEBRIS

3852965 FLOTATION TYPE WATER SWEEP BOOM AND METHODS  
OTHER KEYWORDS: POLLUTANT COLLECTION

3859796 SUBMERSIBLE OIL BOOM

3859797 OIL BOOM

3862904 BOAT FOR COLLECTING OIL SLICKS AND OTHER CONTAMINANTS  
FROM THE SURFACE OF WATER.OTHER KEYWORDS: POLLUTANT COLLECTION ;  
POLLUTANT DEBRIS ; POLLUTANT REMOVAL WATERCRAFT ;  
POLLUTANT, SUCTION REMOVAL

3867817 OIL FENCE HAVING A LIMITED FLEXIBILITY  
OTHER KEYWORDS: POLLUTANT COLLECTION

3868824 MODULAR OIL CONTAINMENT BOOM  
OTHER KEYWORDS: POLLUTANT COLLECTION

3869385 PROCESS FOR CONTAINING OIL SPILLS  
OTHER KEYWORDS: POLLUTANT ABSORPTION

3882682 FLOATING BOOM WITH DEMOUNTABLE FLOATS

3886750 OIL CONTAINMENT APPARATUS  
OTHER KEYWORDS: POLLUTANT COLLECTION

3888086 FLOATING BOOM

3903701 FLOATING BOOM

3906732 SHIPSIDE OIL BARRIER SEAL

3919847 FLOATING ANTI-POLLUTION BARRIER

3921407 OIL SPILL CONTAINING BOOM

3922860 FLOATING BOOM HAVING ROTATABLE FLOAT ELEMENTS

3922861 FLOATING MARINE BARRAGE

3922862 FLOATING CONTAINING VESSELS OR DAMS FOR TRAPPING LIQUID POLLUTANTS  
OTHER KEYWORDS: POLLUTANT COLLECTION

3924412 OIL CONTAINMENT BOOM

3925991 FLOATING OIL FENCE

3926812 FLOATAGE CONCENTRATING EQUIPMENT FOR NAUTICAL FLOATAGE  
RECOVERY APPARATUS.OTHER KEYWORDS: POLLUTANT COLLECTION ;  
POLLUTANT REMOVAL WATERCRAFT

3939663 OIL FENCE HAVING DIRECTIONAL CONTROL DEVICE  
OTHER KEYWORDS: POLLUTANT COLLECTION

3943720 FLOATING OIL BARRIER

3958521 DEEP SEA TANK AND SEAPORT SYSTEM  
OTHER KEYWORDS: OFFSHORE MOORING STRUCTURE ;  
OFFSHORE PLATFORM, FIXED ; POLLUTANT, SUCTION REMOVAL

3962875 OIL FENCE HAVING A LIMITED FLEXIBILITY  
OTHER KEYWORDS: POLLUTANT COLLECTION

3963617 RETRIEVAL MEANS FOR A FLOATING LIQUID SPILLING  
OTHER KEYWORDS: POLLUTANT COLLECTION

3971220 OIL FENCE  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT

3973406 CONTAINMENT BOOM  
OTHER KEYWORDS: POLLUTANT COLLECTION

3979291 OIL BOOM AND METHOD OF SKIMMING FLOATING OIL FROM THE SURFACE  
OF A BODY OF WATER. OTHER KEYWORDS: POLLUTANT COLLECTION ;  
POLLUTANT, SUCTION REMOVAL

3984987 SILT AND POLLUTION CONTROL FOR MARINE FACILITY  
OTHER KEYWORDS: CHANNEL PROTECTION ; PIER, FIXED ;  
POLLUTANT, SUBMERGED BARRIER

3998060 BARRIER FOR WATER CARRIED POLLUTANTS  
OTHER KEYWORDS: POLLUTANT ABSORPTION

RE28966 SYSTEM AND BARRIER FOR CONTAINING AN OIL SPILL  
POWER, SUBMERGED SOURCE

3805515 MODULARIZED SEA POWER ELECTRICAL GENERATOR PLANT  
OTHER KEYWORDS: ELECTRICAL GENERATOR

3808445 WAVE OPERATED POWER PLANT  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; POWER, WAVE

3824797 EVACUATED TUBE WATER HAMMER PILE DRIVING  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE DRIVER, IMPACT

3842917 PUMPED EVACUATED TUBE WATER HAMMER PILE DRIVER  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE DRIVER, IMPACT

3896622 MOBILE POWER GENERATION DEVICE EMPLOYING TROPICAL WATER THERMOCLINE  
OTHER KEYWORDS: ELECTRICAL GENERATOR

3918827 FUEL LESS WATER PRESSURE MACHINE

3927330 WATER POWER MACHINE AND UNDER SEA, UNDER WATER GENERATOR STATION  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; POWER, TIDE ;  
SEABED FOUNDATION

3967449 OCEAN THERMAL GRADIENT POWER PLANT

3967675 METHOD AND DEVICE FOR EXPLOITING THE GEOTHERMAL ENERGY  
IN A SUBMARINE VOLCANO. OTHER KEYWORDS: OFFSHORE CONSTRUCTION ;  
OFFSHORE PLATFORM, FIXED

3992881 APPARATUS TO GENERATE HIGH PRESSURE AIR FROM WATER

3994134 APPARATUS FOR POWER GENERATION IN DEEP SEAWATER  
OTHER KEYWORDS: ELECTRICAL GENERATOR

3995160 METHOD AND APPARATUS FOR OBTAINING ELECTRICAL POWER FROM SEA WATER  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; OFFSHORE PLATFORM FLOATING  
POWER, TIDE

3882320 TIDE ENERGY CONVERSION DEVICE  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; TIDAL INLET

3867817 POWER GENERATING DEVICE

3911287 WAVE DRIVEN POWER GENERATORS  
OTHER KEYWORDS: POWER, WAVE

3918261 WAVE AND TIDE MOTOR  
OTHER KEYWORDS: POWER, WAVE

3927330 WATER POWER MACHINE AND UNDER SEA, UNDER WATER GENERATOR STATION  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; POWER, SUBMERGED SOURCE ;  
SEABED FOUNDATION

3959663 TIDE-POWERED ELECTRICAL GENERATOR  
OTHER KEYWORDS: ELECTRICAL GENERATOR

3973864 TIDE MOTOR

3988592 ELECTRICAL GENERATING SYSTEM  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; POWER, WAVE ; PUMP

3993913 TIDEWATER POWER SYSTEM  
OTHER KEYWORDS: CHANNEL BARRIER ; ELECTRICAL GENERATOR ;  
TIDAL ESTUARY WATER LEVEL  
POWER, WAVE

3783302 APPARATUS AND METHOD FOR CONVERTING WAVE ENERGY  
INTO ELECTRICAL ENERGY. OTHER KEYWORDS: ELECTRICAL GENERATOR

3785159 ATTENUATION OF WATER WAVES AND CONTROL AND UTILIZATION  
OF WAVE-INDUCED WATER MOVEMENTS. OTHER KEYWORDS: BREAKWATER, FLOATING ;  
BREAKWATER, STEEL FRAME ; POLLUTANT COLLECTION ; POLLUTANT  
DISPERSION ; POLLUTANT, SURFACE BARRIER

3808445 WAVE OPERATED POWER PLANT  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; POWER, SUBMERGED SOURCE

3817662 WAVE MOTOR  
OTHER KEYWORDS: PUMP

3818703 WAVE ENERGY CONVERTER ARRAY

3818704 APPARATUS FOR CONVERTING THE ENERGY OF OCEAN WAVES

3828557 ELECTRIC GENERATING APPARATUS CONVERTING THE PUSHING ACTION  
OF WAVES INTO ELECTRICAL POWER. OTHER KEYWORDS: ELECTRICAL GENERATOR

3870893 WAVE OPERATED POWER PLANT  
OTHER KEYWORDS: ELECTRICAL GENERATOR

3872819 WAVE-ACTUATED HORIZONTAL ARRAY STRETCHER  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT

3879950 SPECIAL POWER GENERATING UNIT USING COMPRESSED AIR PRODUCED  
BY OCEAN WAVE TOGETHER WITH SUPER-HEATED STEAM. OTHER KEYWORDS:  
ELECTRICAL GENERATOR ; OFFSHORE PLATFORM, FIXED ; PUMP

3883261 POWER MEANS

3894241 WAVE ACTION POWER SOURCE

3896625 POWER CONVERSION APPARATUS FOR UTILIZING THE FORCE OF WAVES

3898471 ELECTRIC GENERATOR RESPONSIVE TO WAVES IN BODIES OF WATER  
OTHER KEYWORDS: ELECTRICAL GENERATOR

3911287 WAVE DRIVEN POWER GENERATORS  
OTHER KEYWORDS: POWER, TIDE

3912938 ELECTRICAL STATIONS OPERATED BY WAVES  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; OFFSHORE PLATFORM, FLOATING

3918260 WAVED-POWERED DRIVING APPARATUS  
OTHER KEYWORDS: BUOY MOORING SYSTEM

3918261 WAVE AND TIDE MOTOR  
OTHER KEYWORDS: POWER, TIDE

3922739 APPARATUS FOR CONVERTING SEA WAVE ENERGY INTO ELECTRICAL ENERGY  
OTHER KEYWORDS: BUOY, INSTRUMENTED , ELECTRICAL GENERATOR ;  
INSTRUMENT POWER SUPPLY

3928967 APPARATUS AND METHOD FOR EXTRACTING WAVE ENERGY  
OTHER KEYWORDS: ELECTRICAL GENERATOR , PUMP

3930168 WAVE-ACTION POWER APPARATUS  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED , PUMP

3957398 WAVE ENERGIZED PUMP  
OTHER KEYWORDS: PUMP

3961863 WATER ACTION POWERED PUMP  
OTHER KEYWORDS: PUMP

3964264 WAVE-ACTION UNDERSEA-DRILLING RIG  
OTHER KEYWORDS: PILE DRIVER, IMPACT ; SAMPLER, POWER SUPPLY ;  
SAMPLER, SEABED-DRILLED CORE

3965364 WAVE GENERATOR  
OTHER KEYWORDS: ELECTRICAL GENERATOR

3965365 POWER GENERATING MACHINE ACTUATED BY OCEAN SWELLS  
OTHER KEYWORDS: ELECTRICAL GENERATOR

3965679 WAVE ENERGY MACHINE

3970415 ONE WAY VALVE PRESSURE PUMP TURBINE GENERATOR STATION  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; PUMP

3974652 DEVICE FOR CONVERTING WAVE ENERGY IN BODIES OF WATER

3983404 SURF-TURBINE GENERATING SYSTEM  
OTHER KEYWORDS: ELECTRICAL GENERATOR

3988592 ELECTRICAL GENERATING SYSTEM  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; POWER, TIDE ; PUMP

3989951 WAVE ENERGY POWER GENERATING BREAKWATER  
OTHER KEYWORDS: ELECTRICAL GENERATOR , PUMP

3994629 MECHANISM FOR TAPPING THE SURF ENERGY  
OTHER KEYWORDS: PUMP

#### **PUMP**

3787144 EXPLOSIVE PUMPING AND DREDGING METHOD AND APPARATUS  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE INTAKE ; SEABED TRENCHER

3791763 PUMP USED IN DREDGING SYSTEMS OPERATING WITH COMPRESSED AIR  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE INTAKE

3803856 PROCESS AND APPARATUS FOR ACHIEVING THE MECHANICAL TRENCHING  
OF A PIPELINE IN A SUBAQUEOUS DEPTH. OTHER KEYWORDS: DREDGE, SUCTION ;  
DREDGE INTAKE ; SEABED PIPELINE PLACEMENT ; SEABED TRENCHER

3817662 WAVE MOTOR  
OTHER KEYWORDS: POWER, WAVE

3824852 ELECTRICALLY POWERED SUBMERGED PUMP; POWER CIRCUIT THEREFOR,  
AND OCEANOGRAPHIC MONITORING APPARATUS AND METHOD EMPLOYING SAME  
OTHER KEYWORDS: FOULING PREVENTION ; SAMPLER, WATER

3830370 MOTION DECOUPLED SKINNER FOR REMOVING OIL FROM THE SURFACE  
OF CALM OR DISTURBED WATER. OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL

3842521 SUBMERSIBLE DREDGING PUMP AND SHOVEL ARRANGEMENT WITH SUSPENSION  
AND TOWING MEANS THEREFOR. OTHER KEYWORDS: DREDGE, SUCTION ;  
DREDGE INTAKE

3842522 METHOD FOR HYDRAULICALLY RAISING ORE AND OTHER MATERIALS  
OTHER KEYWORDS: DREDGE, SUCTION

3857651 PUMPING UNITS FOR CYCLONIC ELEVATOR  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; DREDGE, SUCTION ; DREDGE INTAKE

3879950 SPECIAL POWER GENERATING UNIT USING COMPRESSED AIR PRODUCED  
BY OCEAN WAVE TOGETHER WITH SUPER-HEATED STEAM. OTHER KEYWORDS:  
ELECTRICAL GENERATOR ; OFFSHORE PLATFORM, FIXED ; POWER, WAVE

3880758 OIL COLLECTION DEVICE  
OTHER KEYWORDS: POLLUTANT, SUCTION REMOVAL

3881530 PLANT FOR EVACUATING DREDGED MATERIAL  
OTHER KEYWORDS: DREDGE-SPOIL TRANSPORT ; HOPPER BARGE ;  
OFFSHORE MOORING STRUCTURE

3881840 CENTRIFUGAL PUMP FOR PROCESSING LIQUIDS CONTAINING ABRASIVE  
CONSTITUENTS, MORE PARTICULARLY, A SAND PUMP OR A WASTE-WATER PUMPER  
OTHER KEYWORDS: DREDGE-SPOIL TRANSPORT

3919790 PUSHED SUCTION DREDGER AND BARGE COMBINATION  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; DREDGE INTAKE ;  
DREDGE PROPULSION

3928967 APPARATUS AND METHOD FOR EXTRACTING WAVE ENERGY  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; POWER, WAVE

3930168 WAVE-ACTION POWER APPARATUS  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; POWER, WAVE

3957398 WAVE ENERGIZED PUMP  
OTHER KEYWORDS: POWER, WAVE

3958346 MULTIPLE PUMPING CHAMBER DREDGING APPARATUS  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE INTAKE ; SAMPLER, SEABED GRAB

3961863 WATER ACTION POWERED PUMP  
OTHER KEYWORDS: POWER, WAVE

3962803 DREDGING HEAD  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; DREDGE INTAKE ;  
WATER PLANT REMOVAL

3969834 AIRLIFT  
OTHER KEYWORDS: DREDGE, SUCTION

3970415 ONE WAY VALVE PRESSURE PUMP TURBINE GENERATOR STATION  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; POWER, WAVE

3971513 DREDGE PUMP  
OTHER KEYWORDS: DREDGE, SUCTION

3988592 ELECTRICAL GENERATING SYSTEM  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; POWER, TIDE ; POWER, WAVE

3989951 WAVE ENERGY POWER GENERATING BREAKWATER  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; POWER, WAVE

3994082 AIR OPERATED DREDGING APPARATUS  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE INTAKE

3994629 MECHANISM FOR TAPPING THE SURF ENERGY  
OTHER KEYWORDS: POWER, WAVE

#### REVETMENT

3786640 MEANS AND METHOD FOR PRODUCING STEPPED CONCRETE SLOPE STRUCTURES  
OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ;  
LOW-COST SHORE PROTECTION ; SANDBAG ; SLOPE PROTECTION

3837169 REINFORCED MATTRESS FOR PROTECTING SHORELINES AND THE LIKE  
OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT

3871182 METHOD OF PROTECTION FOR SLOPES AND CRESTS OF RIVERS, CHANNELS,  
AND THE LIKE. OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ;  
SEABED MATERIAL PLACEMENT ; SLOPE PROTECTION

3903702 REVETMENT STRUCTURE  
OTHER KEYWORDS: CONCRETE BLOCK ; LOW-COST SHORE PROTECTION ;  
SLOPE PROTECTION

3990247 SYSTEM OF STRUCTURES TO RESIST HYDRODYNAMIC FORCES  
OTHER KEYWORDS: CONCRETE ARMOR UNIT

#### SALINITY MEASUREMENT

3878456 STANDARD CONDUCTIVITY CELL FOR MEASUREMENT OF SEAWATER SALINITY  
AND TEMPERATURE. OTHER KEYWORDS: BATHYTHERMOGRAPH

3906353 OSCILLATOR CIRCUIT FOR PROVIDING A CONDUCTIVITY RATIO OF SEA WATER

3906354 STANDARD CONDUCTIVITY CELL FOR MEASUREMENT OF SEA WATER SALINITY  
AND TEMPERATURE. OTHER KEYWORDS: BATHYTHERMOGRAPH

3926056 CONDUCTIVITY, TEMPERATURE AND PRESSURE MEASURING SYSTEM  
OTHER KEYWORDS: BATHYTHERMOGRAPH ; DEPTH PRESSURE MEASUREMENT

3939408 CONDUCTIVITY CELL AND MEASURING SYSTEM

3991623 MARINE INSTRUMENT  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT

3992105 METHOD AND APPARATUS FOR REMOTE SALINITY SENSING  
OTHER KEYWORDS: INSTRUMENT, AIRBORNE

#### SAMPLER, BIOTA

3890844 PERIPHYTON SAMPLER AND METHOD FOR SAMPLING  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT

3892130 DEEP SEA MICROBIOLOGICAL SAMPLING AND CULTURING APPARATUS AND METHOD  
OTHER KEYWORDS: SAMPLER, WATER

3955421 PERIPHYTON SAMPLER FOR WATER QUALITY MONITORING  
OTHER KEYWORDS: POLLUTANT MEASUREMENT



**SAMPLER, POWER SUPPLY**

3948058 DEVICE FOR SOIL SAMPLING UNDER WATER  
OTHER KEYWORDS: SAMPLER, SEABED-DRIVEN CORE

3964264 WAVE-ACTION UNDERSEA-DRILLING RIG  
OTHER KEYWORDS: PILE DRIVER, IMPACT ; POWER, WAVE ;  
SAMPLER, SEABED-DRILLED CORE

**SAMPLER, SEABED-DRILLED CORE**

3874465 CORING APPARATUS

3891037 REMOTELY OPERATED SEAFLOOR CORING AND DRILLING METHOD AND SYSTEM  
OTHER KEYWORDS: EMBEDMENT ANCHOR ; INSTRUMENT DEPLOYMENT ;  
PILE PLACEMENT

3964264 WAVE-ACTION UNDERSEA-DRILLING RIG  
OTHER KEYWORDS: PILE DRIVER, IMPACT ; POWER, WAVE ;  
SAMPLER, POWER SUPPLY

**SAMPLER, SEABED-DRIVEN CORE**

3805898 FOLDING BOTTOM CORE SAMPLER  
OTHER KEYWORDS: INSTRUMENT RETRIEVAL

3807234 CORE CATCHER FOR CORE SAMPLERS

3833075 EXPENDABLE CORE NOSE AND CORE CATCHER RETAINER

3848682 FREE-FALL CORER  
OTHER KEYWORDS: INSTRUMENT RETRIEVAL

3874462 DEVICE FOR TAKING CORE SAMPLES FROM OCEAN AND OTHER SUBMARINE FLOORS  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ; INSTRUMENT RETRIEVAL

3875796 APPARATUS FOR CONTINUOUSLY RECORDING SEA-FLOOR SEDIMENT  
CORER OPERATIONS. OTHER KEYWORDS: INSTRUMENT, SEABED IN SITU ;  
SEABED PROPERTY MEASUREMENT

3901075 ACOUSTIC VELOCIMETER FOR OCEAN BOTTOM CORING APPARATUS  
OTHER KEYWORDS: INSTRUMENT, SEABED IN SITU ;  
SEABED PROPERTY MEASUREMENT

3948058 DEVICE FOR SOIL SAMPLING UNDER WATER  
OTHER KEYWORDS: SAMPLER, POWER SUPPLY

3949819 SOIL SAMPLING DEVICE

3970156 WATER WEIGHTED CORER  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ; INSTRUMENT RETRIEVAL

**SAMPLER, SEABED GRAB**

3885440 FREE-GRAB DEVICE FOR COLLECTING UNDERWATER SAMPLES

3949497 RELEASABLE LATCHING APPARATUS FOR A BENTHIC GRAB  
OTHER KEYWORDS: DREDGE, MECHANICAL

3958346 MULTIPLE PUMPING CHAMBER DREDGING APPARATUS  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE INTAKE ; PUMP

3996678 FREE-FALL GRAB  
OTHER KEYWORDS: INSTRUMENT RETRIEVAL

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**SAMPLER, SURFACE**

- 3811325 APPARATUS FOR COLLECTING SURFACE PARTICLES ON BODY OF WATER  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ; POLLUTANT COLLECTION
- 3931740 APPARATUS FOR COLLECTING SURFACE PARTICLE ON BODY OF WATER  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ; POLLUTANT COLLECTION
- 3988932 OIL SLICK SAMPLING APPARATUS AND METHOD  
OTHER KEYWORDS: POLLUTANT MEASUREMENT

**SAMPLER, SUSPENDED SEDIMENT**

- 3969925 IN SITU OCEANOGRAPHIC SAMPLE SEPARATOR
- 3975957 SEDIMENT SAMPLING SYSTEM  
OTHER KEYWORDS: SEDIMENTATION MEASUREMENT

**SAMPLER, WATER**

- 3815422 MULTI-CAPACITY WATER SAMPLER
- 3824852 ELECTRICALLY POWERED SUBMERGED PUMP, POWER CIRCUIT THEREFOR,  
AND OCEANOGRAPHIC MONITORING APPARATUS AND METHOD EMPLOYING SAME  
OTHER KEYWORDS: FOULING PREVENTION ; PUMP
- 3841156 COMBINED DEPTH INDICATOR AND WATER SAMPLER  
OTHER KEYWORDS: DEPTH PRESSURE MEASUREMENT ; INSTRUMENT, TOWED ;  
TOWED VEHICLE
- 3841162 OPERATING APPARATUS FOR WATER SAMPLERS
- 3892130 DEEP SEA MICROBIOLOGICAL SAMPLING AND CULTURING APPARATUS AND METHOD  
OTHER KEYWORDS: SAMPLER, BIOTA

**SANDBAG**

- 3786640 MEANS AND METHOD FOR PRODUCING STEPPED CONCRETE SLOPE STRUCTURES  
OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ;  
LOW-COST SHORE PROTECTION ; REVETMENT ; SLOPE PROTECTION
- 3861158 SUBMERGED PIPELINE STABILIZATION  
OTHER KEYWORDS: CONCRETE FORM ; SEABED FOUNDATION ;  
SEABED PIPELINE PLACEMENT
- 3886751 AQUATIC CONSTRUCTION MODULE AND METHOD OF FORMING THEREOF  
OTHER KEYWORDS: CONCRETE FORM ; LOW-COST SHORE PROTECTION
- 3957098 EROSION CONTROL BAG  
OTHER KEYWORDS: LOW-COST SHORE PROTECTION ;  
SEABED MATERIAL PLACEMENT
- 3990252 EARTHWORKS CONSOLIDATION SYSTEM  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE ISLAND ;  
SEABED SOIL TREATMENT

**SAND FENCE**

- 3844125 ANTI-EROSION DEVICE  
OTHER KEYWORDS: BAR PROTECTION ; BREAKWATER, STEEL FRAME ;  
SEABED FOUNDATION
- 3913333 MEANS AND APPARATUS FOR CONTROLLING FLUID CURRENTS  
AND SELECTIVELY PRESERVING AND MODIFYING TOPOGRAPHY SUBJECTED THERETO  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; CHANNEL PROTECTION ;  
DUNE PROTECTION ; SEAWALL ; TIDAL INLET

SEABED CABLE PLOW

- 3788085 METHOD AND APPARATUS FOR LAYING A PIPE LINE  
OTHER KEYWORDS: SEABED PIPELINE PLACEMENT
- 3803541 METHOD OF MONITORING OPERATING CONDITION  
OF SUBMARINE CABLE-BURYING DEVICES.OTHER KEYWORDS: SONAR, DEPTH SOUNDER
- 3824798 SUBMARINE CABLE-BURYING DEVICES
- 3898852 DITCHING MACHINES FOR SUBMARINE CABLE
- 3952532 UNDERWATER TRENCHING AND CABLE LAYING APPARATUS  
OTHER KEYWORDS: SEABED TRENCHER
- 3982403 LAYING CABLES AND THE LIKE UNDER WATER
- 3990377 SELF-PROPELLED MACHINE FOR SEA-BED WORK

SEABED FOUNDATION

- 3782127 METHOD AND APPARATUS FOR DEPOSITING FOUNDATIONS  
UNDER SUBMERGED STRUCTURES.OTHER KEYWORDS: OFFSHORE CONSTRUCTION ;  
SEABED MATERIAL PLACEMENT
- 3783626 STRUCTURE,AND METHOD AND APPARATUS FOR FOUNDING A STRUCTURE  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE, SUBMERGED ;  
OFFSHORE CONSTRUCTION
- 3785158 HYDRAULIC ENGINEERING INSTALLATIONS  
OTHER KEYWORDS: FABRIC MAT ; OFFSHORE CONSTRUCTION ;  
OFFSHORE PLATFORM ANCHOR ; OFFSHORE STORAGE TANK, EMERGENT ;  
SEABED SOIL TREATMENT
- 3791152 OFFSHORE STORAGE SYSTEM  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, EMERGENT
- 3793840 MOBILE, ARCTIC DRILLING AND PRODUCTION PLATFORM  
OTHER KEYWORDS: ICE PROTECTION ; OFFSHORE CAISSON ;  
OFFSHORE PLATFORM, JACK UP
- 3793842 SELF-STABILIZING SUBMARINE TANK  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, SUBMERGED
- 3797256 JACK UP TYPE OFFSHORE PLATFORM APPARATUS  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP ; OFFSHORE PLATFORM, LEG ;  
PILE PLACEMENT
- 3798912 ARTIFICIAL ISLANDS AND METHOD OF CONTROLLING ICE MOVEMENT  
IN NATURAL OR MAN-MADE BODIES OF WATER.OTHER KEYWORDS:  
ICE PROTECTION ; OFFSHORE ISLAND ; OFFSHORE STRUCTURE FENDER ;  
ICE STRUCTURE
- 3803852 PROCESS FOR BUILDING AN ISLAND  
OTHER KEYWORDS: ARTIFICIAL SEAWALL ; OFFSHORE CONSTRUCTION ;  
OFFSHORE ISLAND
- 3803855 SUBMERGED OIL STORAGE TANK  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ;  
OFFSHORE STORAGE TANK, SUBMERGED
- 3817040 PILE DRIVING METHOD  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE DRIVER, WATER JET ;  
PILE, STEEL ; PILE FOOTING

3823563 SPUD TANK FOR OFFSHORE DRILLING UNIT  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP ; OFFSHORE PLATFORM, LEG

3824795 PLATFORM STRUCTURE  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE PLATFORM, FIXED

3826098 METHOD AND MEANS FOR REDUCING WAVE PRESSURES ON UNDERSEA CONSTRUCTIONS  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, SUBMERGED

3832857 PRESSURE GROUTING  
OTHER KEYWORDS: GROUTING ; PILE, STRUCTURE CONNECTION

3839873 METHOD OF ERECTING A TOWER ON THE SEABED, IN DEEP WATER  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE PLATFORM, LEG ; PILE PLACEMENT

3841103 CURRENT STABILIZING MEANS FOR ISLAND AIRPORT FOUNDATIONS  
OTHER KEYWORDS: OFFSHORE ISLAND

3844125 ANTI-EROSION DEVICE  
OTHER KEYWORDS: BAR PROTECTION ; BREAKWATER, STEEL FRAME ; SAND FENCE

3849994 GUIDE BASE AND METHOD FOR SETTING SAME  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; SEABED OIL, PROCESS STRUCTURE

3851476 METHOD AND APPARATUS FOR BREAKING WAVES  
OTHER KEYWORDS: BREAKWATER, STEEL FRAME

3859803 ANTI-SCOUR MEANS FOR SUBMARINE STRUCTURES  
OTHER KEYWORDS: SEABED SCOUR PROTECTION

3861158 SUBMERGED PIPELINE STABILIZATION  
OTHER KEYWORDS: CONCRETE FORM ; SANDBAG ; SEABED PIPELINE PLACEMENT

3874180 MODULAR OFFSHORE STRUCTURE SYSTEM  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; OFFSHORE PLATFORM, JACK UP ;  
PILE PLACEMENT

3877520 SUBSEA COMPLETION AND REWORK SYSTEM FOR DEEP WATER OIL WELLS  
OTHER KEYWORDS: SEABED OIL, PROCESS STRUCTURE

3878662 METHOD OF CONSTRUCTING A REMOTELY LOCATED DRILLING STRUCTURE  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FIXED ;  
PILE PLACEMENT

3879952 PRESSURE RESISTANT CAISSON  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE PLATFORM, LEG

3881549 PRODUCTION AND FLARE CAISSON SYSTEM  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE CONSTRUCTION ;  
OFFSHORE PLATFORM, FIXED ; SEABED OIL, PROCESS STRUCTURE

3886753 SUBMERSIBLE STRUCTURES  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ;  
OFFSHORE STORAGE TANK, SUBMERGED

3888209 ARTIFICIAL REEF  
OTHER KEYWORDS: BAR PROTECTION ; BREAKWATER, CONCRETE

3896624 POLYHEDRAL, POROUS, AND HOLLOW BLOCK  
OTHER KEYWORDS: CONCRETE BLOCK

3896628 MARINE STRUCTURES  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FIXED

3897639 VEHICLE FOR UNDERWATER EXCAVATION BENEATH A STRUCTURE  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE PROPULSION ;  
DREDGE, SUBMERGED ; OFFSHORE CONSTRUCTION

3898847 FIXED PLATFORM FOR DEEP SEA DEPTHS ABLE TO HOUSE PLANTS,  
EQUIPMENTS STRUCTURES, MEN AND MEANS. OTHER KEYWORDS:  
OFFSHORE CAISSON ; OFFSHORE PLATFORM, FIXED ; SEABED SCOUR PROTECTION

3906734 FIXED MARINE PLATFORM WITH DISPERSED BASE  
OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ;  
OFFSHORE PLATFORM, FIXED ; SEABED SCOUR PROTECTION

3906735 FOUNDATION METHOD FOR CAISSONS  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE CONSTRUCTION

3911687 FOUNDATION METHOD FOR CAISSONS  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE CONSTRUCTION

3913335 OFFSHORE TERMINAL  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE STORAGE TANK, SUBMERGED ; SEABED SCOUR PROTECTION

3914947 SUBAQUATIC STRUCTURE  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE PLATFORM, FIXED ;  
SEABED SCOUR PROTECTION

3916632 TELESCOPIC CAISSON WITH INTERMEDIATELY POSITIONED WELLHEAD  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE PLATFORM, FIXED

3924414 PILE FOR USE IN OFFSHORE AREAS HAVING A SHIFTING LAYER OF MUD  
OTHER KEYWORDS: PILE PROTECTION ; SEABED SOIL TREATMENT

3927330 WATER POWER MACHINE AND UNDER SEA, UNDER WATER GENERATOR STATION  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; POWER, SUBMERGED SOURCE ;  
POWER, TIDE

3927535 JACK-UP TYPE OFFSHORE OIL PRODUCTION PLATFORM APPARATUS AND METHOD  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, JACK UP ;  
OFFSHORE PLATFORM, LEG

3928982 METHOD AND DEVICE FOR A FOUNDATION BY DEPRESSION IN AN AQUATIC SITE  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ;  
OFFSHORE STORAGE TANK, SUBMERGED ; SEABED SOIL TREATMENT

3934658 MODULAR UNDERWATER WELL PLATFORM SYSTEM  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FIXED

3938339 MEANS FOR SLOWING AND/OR DETOURING WATER CURRENTS  
AND THE PREPARATION THEREOF. OTHER KEYWORDS: FABRIC MAT ; GROIN ;  
JETTY ; OFFSHORE CONSTRUCTION

3938342 METHOD AND A DEVICE FOR BUILDING IMMERSED FOUNDATIONS  
OTHER KEYWORDS: CONCRETE FORM ; GROUTING ; OFFSHORE CONSTRUCTION .  
SEABED MATERIAL PLACEMENT

3938343 PLATFORM STRUCTURE FOR MARITIME INSTALLATION  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; PILE DRIVER, WATER JET

3939664 LARGE DIAMETER TUBULAR PILES AND THE BEDDING THEREOF  
OTHER KEYWORDS: GROUTING ; PILE FOOTING ; PILE, STEEL

3943724 UNDERWATER STATIONARY TANK FOR STORING LARGE AMOUNTS OF CRUDE OIL  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, SUBMERGED

- 3945212 ARRANGEMENT IN OR RELATING TO CAISSONS OR THE LIKE  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE CONSTRUCTION ;  
OFFSHORE PLATFORM, FIXED ; PILE PLACEMENT
- 3950805 COMBINATION PROVIDING SAFETY BERTHING, UNLOADING OF OIL,  
AND CONDUIT CARRIAGE TO REFINERIES ON LAND, OF LARGE  
DEEP-SEA-REQUIRING TANKERS. OTHER KEYWORDS:  
OFFSHORE MOORING STRUCTURE ; OFFSHORE PLATFORM, FIXED ;  
PILE DRIVER, WATER JET
- 3955372 METHOD OF INSTALLING A FIXED MARINE PLATFORM WITH DISPERSED BASE  
OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ; OFFSHORE PLATFORM, FIXED ;  
SEABED MATERIAL PLACEMENT ; SEABED SCOUR PROTECTION
- 3961489 METHOD FOR PLACING A FLOATING STRUCTURE ON THE SEA BED  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE CONSTRUCTION
- 3962878 STABILIZATION OF MARITIME STRUCTURES  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; SEABED SOIL TREATMENT
- 3965688 UNDERWATER STRUCTURES, IN PARTICULAR FOR UNDERWATER  
DRILLING OPERATIONS. OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED
- 3969900 BREAKWATER CONSTRUCTION  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; OFFSHORE CAISSON ;  
OFFSHORE CONSTRUCTION
- 3972198 METHOD OF PROTECTING A PILE IMBEDDED IN OFFSHORE AREAS  
HAVING A SHIFTING LAYER OF MUD. OTHER KEYWORDS:  
PILE PROTECTION ; SEABED SOIL TREATMENT
- 3974657 MODULAR OFFSHORE STRUCTURE SYSTEM  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, SUBMERGED ; PILE PLACEMENT
- 3987636 METHODS AND APPARATUS FOR ANCHORING A SUBMERGED STRUCTURE  
TO A WATERBED. OTHER KEYWORDS: GROUTING ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE PLATFORM, LEG ; PILE FOOTING ; PILE, STRUCTURE CONNECTION
- 3987638 SURGE STRUCTURE AND METHOD FOR INSTALLING THE STRUCTURE  
AND RECOVERING THE STRUCTURE FROM THE SEA FLOOR  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE PLACEMENT ;  
SEABED OIL, PROCESS STRUCTURE
- 3996754 MOBILE MARINE DRILLING UNIT  
OTHER KEYWORDS: OFFSHORE PLATFORM, JACK UP ;  
OFFSHORE STORAGE TANK, SUBMERGED
- 3996756 METHOD AND APPARATUS FOR SUPPORTING A DRILLING PLATFORM  
ON THE OCEAN FLOOR. OTHER KEYWORDS: OFFSHORE CONSTRUCTION ;  
OFFSHORE PLATFORM ANCHOR
- 3998061 FORMATION OF CAVITIES IN THE BED OF A SHEET OF WATER  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE STORAGE TANK, SUBMERGED
- 3998062 SEA FLOOR SUPPORTED STRUCTURES WITH CRUSHABLE SUPPORT  
OTHER KEYWORDS: OFFSHORE STORAGE TANK, EMERGENT
- 3999395 SUPPORT ARRANGEMENT FOR A CONSTRUCTION  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ;  
OFFSHORE STORAGE TANK, SUBMERGED

**SEABED GRADER**

**3892079 CONTROL SYSTEM FOR AMPHIBIOUS HYDRAULIC EXCAVATOR**  
**OTHER KEYWORDS: SEABED TRENCHER**

**SEABED MATERIAL PLACEMENT**

**3782127 METHOD AND APPARATUS FOR DEPOSITING FOUNDATIONS**  
**UNDER SUBMERGED STRUCTURES.OTHER KEYWORDS: OFFSHORE CONSTRUCTION ;**  
**SEABED FOUNDATION**

**3791153 METHOD FOR PLACING HYDRAULIC CONCRETE**  
**OTHER KEYWORDS: CONCRETE FORM ; OFFSHORE CONSTRUCTION**

**3793845 APPARATUS AND METHOD FOR ANCHORING SUBMERGED CONDUIT**  
**OTHER KEYWORDS: FABRIC MAT ; SEABED PIPELINE PLACEMENT ;**  
**SEABED SCOUR PROTECTION**

**3861157 APPARATUS FOR DEPOSITING UNDER WATER A FLOWABLE HARDENABLE**  
**OR NOT HARDENABLE MASS.OTHER KEYWORDS: ASPHALT ; CONCRETE FORM**

**3871182 METHOD OF PROTECTION FOR SLOPES AND CRESTS OF RIVERS, CHANNELS,**  
**AND THE LIKE.OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ; REVETMENT ;**  
**SLOPE PROTECTION**

**3893304 METHOD AND A DEVICE FOR THE UNDERWATER CONSTRUCTION**  
**OF CONCRETE STRUCTURES.OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ;**  
**OFFSHORE CONSTRUCTION ; OFFSHORE PLATFORM, FIXED**

**3894401 SAND FILL COMPACTION SYSTEM**  
**OTHER KEYWORDS: DREDGE-SPOIL TRANSPORT ; SEABED SOIL TREATMENT**

**3922865 MATTRESS, METHOD OF SINKING A MATTRESS AND VESSEL SUITABLE**  
**FOR USE IN SAID METHOD.OTHER KEYWORDS: CONCRETE BLOCK ; FABRIC MAT ;**  
**SLOPE PROTECTION**

**3938342 METHOD AND A DEVICE FOR BUILDING IMMERSSED FOUNDATIONS**  
**OTHER KEYWORDS: CONCRETE FORM ; GROUTING ; OFFSHORE CONSTRUCTION ;**  
**SEABED FOUNDATION**

**3955372 METHOD OF INSTALLING A FIXED MARINE PLATFORM WITH DISPERSED BASE**  
**OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ; OFFSHORE PLATFORM, FIXED ;**  
**SEABED FOUNDATION ; SEABED SCOUR PROTECTION**

**3957098 EROSION CONTROL BAG**  
**OTHER KEYWORDS: LOW-COST SHORE PROTECTION ; SANDBAG**

**SEABED OIL, PROCESS STRUCTURE**

**3849994 GUIDE BASE AND METHOD FOR SETTING SAME**  
**OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; SEABED FOUNDATION**

**3877520 SUBSEA COMPLETION AND REWORK SYSTEM FOR DEEP WATER OIL WELLS**  
**OTHER KEYWORDS: SEABED FOUNDATION**

**3881549 PRODUCTION AND FLARE CAISSON SYSTEM**  
**OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE CONSTRUCTION ;**  
**OFFSHORE PLATFORM, FIXED ; SEABED FOUNDATION**

**3946568 OFFSHORE OIL PRODUCTION PLATFORM**  
**OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ;**  
**OFFSHORE STORAGE TANK, SUBMERGED**



3987638 SUBSEA STRUCTURE AND METHOD FOR INSTALLING THE STRUCTURE  
AND RECOVERING THE STRUCTURE FROM THE SEA FLOOR  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; PILE PLACEMENT ;  
SEABED FOUNDATION

3990254 MARINE STRUCTURE FOR OFFSHORE ACTIVITIES  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; OFFSHORE PLATFORM, LEG

RE28978 FAIL-SAFE SUBSEA FLUID TRANSPORTATION SYSTEM  
OTHER KEYWORDS: POLLUTANT COLLECTION ; POLLUTANT, SUBMERGED BARRIER

#### SEABED PIPELINE PLACEMENT

3786642 METHOD AND APPARATUS FOR ENTRENCHING SUBMERGED ELONGATE STRUCTURES  
OTHER KEYWORDS: SEABED TRENCHER

3788085 METHOD AND APPARATUS FOR LAYING A PIPE LINE  
OTHER KEYWORDS: SEABED CABLE PLOW

3791156 METHOD AND APPARATUS FOR DETERMINING THE POSITION OF A PIPELINE  
OR THE LIKE DURING THE ENTRENCHING THEREOF  
OTHER KEYWORDS: SEABED TRENCHER

3793845 APPARATUS AND METHOD FOR ANCHORING SUBMERGED CONDUIT  
OTHER KEYWORDS: FABRIC MAT ; SEABED MATERIAL PLACEMENT ;  
SEABED SCOUR PROTECTION

3797260 PIPELINE ANCHORING SYSTEM  
OTHER KEYWORDS: EMBEDMENT ANCHOR

3803856 PROCESS AND APPARATUS FOR ACHIEVING THE MECHANICAL TRENCHING  
OF A PIPE-LINE IN A SUB-AQUEOUS DEPTH, OTHER KEYWORDS:  
DREDGE, SUCTION ; DREDGE INTAKE ; PUMP ; SEABED TRENCHER

3822558 ARCTIC DREDGING AND PIPELAYING  
OTHER KEYWORDS: DREDGE PROPULSION ; ICE PROTECTION ; SEABED TRENCHER

3841105 METHOD AND APPARATUS FOR ANCHORING UNDERWATER PIPELINES  
OTHER KEYWORDS: EMBEDMENT ANCHOR

3841106 PIPELINE ANCHORING SYSTEMS  
OTHER KEYWORDS: EMBEDMENT ANCHOR

3851492 APPARATUS AND METHOD FOR OFFSHORE OPERATIONS  
OTHER KEYWORDS: EMBEDMENT ANCHOR ; SEABED TRENCHER

3852972 SUBMERGED PIPELINE BURIAL APPARATUS  
OTHER KEYWORDS: SEABED TRENCHER

3857250 UNDERWATER VEHICLE FOR LAYING UNDERGROUND CABLES AND PIPELINES  
OTHER KEYWORDS: SEABED TRENCHER

3861158 SUBMERGED PIPELINE STABILIZATION  
OTHER KEYWORDS: CONCRETE FORM ; SANDBAG ; SEABED FOUNDATION

3877237 UNDERWATER TRENCHING APPARATUS GUIDANCE SYSTEM  
OTHER KEYWORDS: SEABED TRENCHER

3877238 SEA SLED FOR ENTRENCHING AND PIPE BURYING OPERATIONS  
OTHER KEYWORDS: SEABED TRENCHER

3893404 PULL-AREAD WINCH CONTROL SYSTEM  
OTHER KEYWORDS: SEABED TRENCHER ; TOW WINCH CONTROL

3910038 CONSTRUCTION OF INNERSED STRUCTURES  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE CONSTRUCTION ;  
SEABED WATER, PROCESS STRUCTURE

3926003 BUOYANCY AND ATTITUDE CORRECTION METHOD AND APPARATUS  
OTHER KEYWORDS: SEABED TRENCHER

3975784 MARINE STRUCTURE  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE PROPULSION ;  
OFFSHORE PLATFORM ANCHOR ; OFFSHORE PLATFORM, FLOATING ;  
POLLUTANT DISPERSION ; SEABED TRENCHER

3978679 METHOD AND APPARATUS FOR UNDERWATER TRENCH EXCAVATION  
AND PIPELINE LAYING. OTHER KEYWORDS: DREDGE, CUTTERHEAD ;  
DREDGE, SUBMERGED ; SPARED TRENCHER

3995439 DEVICE FOR EMBEDDING OBJECTS SUCH AS CONTINUOUS PIPES  
INTO WATER BOTTOMS. OTHER KEYWORDS: SEABED TRENCHER

3996794 DIFFERENTIAL DEPTH INDICATOR  
OTHER KEYWORDS: DEPTH PRESSURE MEASUREMENT ;  
INSTRUMENT DEPLOYMENT ; SEABED SITE SURVEY

#### SEABED PROPERTY MEASUREMENT

3875796 APPARATUS FOR CONTINUOUSLY RECORDING SEA-FLOOR SEDIMENT  
CORER OPERATIONS. OTHER KEYWORDS: INSTRUMENT, SEABED IN SITU ;  
SAMPLER, SEABED-DRIVEN CORE

3901075 ACOUSTIC VELOCIMETER FOR OCEAN BOTTOM CORING APPARATUS  
OTHER KEYWORDS: INSTRUMENT, SEABED IN SITU ;  
SAMPLER, SEABED-DRIVEN CORE

3940732 BUOYANT ELECTRODE AND SYSTEM FOR HIGH SPEED TOWING  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ; TOWING CABLE

3964424 INFLUENCE DETECTING GEAR WITH IMPROVED TOWING CHARACTERISTICS  
OTHER KEYWORDS: INSTRUMENT, SEABED IN SITU ; INSTRUMENT, TOWED ;  
TOWING CABLE

#### SEABED SCOUR PROTECTION

3793845 APPARATUS AND METHOD FOR ANCHORING SUBMERGED CONDUIT  
OTHER KEYWORDS: FABRIC MAT ; SEABED MATERIAL PLACEMENT ;  
SEABED PIPELINE PLACEMENT

3811287 BOTTOM AND BANK FACING  
OTHER KEYWORDS: FABRIC MAT ; SLOPE PROTECTION

3844123 DEVICE FOR PRODUCING AND PROTECTING DEPOSITS  
OF SEDIMENTARY MATERIAL ON THE FLOOR OF BODIES OF  
WATER. OTHER KEYWORDS: BAR PROTECTION ; FABRIC MAT

3859803 ANTI-SCOUR MEANS FOR SUBMARINE STRUCTURES  
OTHER KEYWORDS: SEABED FOUNDATION

3878684 DEVICES FOR PROTECTING THE BASES OF STRUCTURES IMMERSED  
IN A VOLUME OF WATER, AGAINST UNDERMINING. OTHER KEYWORDS:  
BREAKWATER, CONCRETE ; SEAWALL

3898847 FIXED PLATFORM FOR DEEP SEA DEPTHS ABLE TO HOUSE PLANTS,  
EQUIPMENTS STRUCTURES, MEN AND MEANS. OTHER KEYWORDS:  
OFFSHORE CAISSON ; OFFSHORE PLATFORM, FIXED ; SEABED FOUNDATION

3906734 FIXED MARINE PLATFORM WITH DISPERSED BASE  
OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ;  
OFFSHORE PLATFORM, FIXED ; SEABED FOUNDATION

- 3913335 OFFSHORE TERMINAL  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE STORAGE TANK, SUBMERGED ; SEABED FOUNDATION
- 3914947 SUBAQUATIC STRUCTURE  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE PLATFORM, FIXED ;  
SEABED FOUNDATION
- 3928978 APPARATUS FOR PRODUCING AND PROTECTING DEPOSITS  
OF SEDIMENTARY MATERIAL ON FLOORS OF BODIES OF WATER  
OTHER KEYWORDS: BAR PROTECTION ; FABRIC MAT
- 3955372 METHOD OF INSTALLING A FIXED MARINE PLATFORM WITH DISPERSED BASE  
OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ;  
OFFSHORE PLATFORM, FIXED ; SEABED FOUNDATION ; SEABED  
MATERIAL PLACEMENT
- 3983705 APPARATUS FOR FORMING A BOTTOM PROTECTION  
OTHER KEYWORDS: FABRIC MAT

#### SEABED SITE SURVEY

- 3800272 ROTATING ACOUSTIC SCANNER SYSTEM FOR POSITIONING OBJECTS  
ON THE OCEAN FLOOR. OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ;  
OFFSHORE CONSTRUCTION ; SONAR, SIDE LOOKING
- 3978444 SEAFLOOR MAPPING SYSTEM  
OTHER KEYWORDS: SONAR, SIDE LOOKING
- 3996794 DIFFERENTIAL DEPTH INDICATOR  
OTHER KEYWORDS: DEPTH PRESSURE MEASUREMENT ; INSTRUMENT DEPLOYMENT  
SEABED PIPELINE PLACEMENT

#### SEABED SOIL TREATMENT

- 3785158 HYDRAULIC ENGINEERING INSTALLATIONS  
OTHER KEYWORDS: FABRIC MAT ; OFFSHORE CONSTRUCTION ;  
OFFSHORE PLATFORM ANCHOR ; OFFSHORE STORAGE  
TANK, EMERGENT ; SEABED FOUNDATION
- 3894401 SAND FILL COMPACTION SYSTEM  
OTHER KEYWORDS: DREDGE-SPOIL TRANSPORT ; SEABED MATERIAL PLACEMENT
- 3924414 PILE FOR USE IN OFFSHORE AREAS HAVING A SHIFTING LAYER OF MUD  
OTHER KEYWORDS: PILE PROTECTION ; SEABED FOUNDATION
- 3928982 METHOD AND DEVICE FOR A FOUNDATION BY DEPRESSION IN AN AQUATIC SITE  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ;  
OFFSHORE STORAGE TANK SUBMERGED , SEABED FOUNDATION
- 3962878 STABILIZATION OF MARITIME STRUCTURES  
OTHER KEYWORDS: OFFSHORE PLATFORM, FIXED ; SEABED FOUNDATION
- 3972198 METHOD OF PROTECTING A PILE IMBEDDED IN OFFSHORE AREAS  
HAVING A SHIFTING LAYER OF MUD. OTHER KEYWORDS: PILE PROTECTION ;  
SEABED FOUNDATION
- 3990252 EARTHWORKS CONSOLIDATION SYSTEM  
OTHER KEYWORDS: OFFSHORE CONSTRUCTION ; OFFSHORE ISLAND ; SANDBAG

#### SEABED TRENCHER

- 3786642 METHOD AND APPARATUS FOR ENTRENCHING SUBMERGED ELONGATE STRUCTURES  
OTHER KEYWORDS: SEABED PIPELINE PLACEMENT

- 3767144 EXPLOSIVE PUMPING AND DREDGING METHOD AND APPARATUS  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE INTAKE ; PUMP
- 3791156 METHOD AND APPARATUS FOR DETERMINING THE POSITION OF A PIPELINE  
OR THE LIKE DURING THE ENTRENCHING THEREOF  
OTHER KEYWORDS: SEABED PIPELINE PLACEMENT
- 3803856 PROCESS AND APPARATUS FOR ACHIEVING THE MECHANICAL TRENCHING  
OF A PIPE-LINE IN A SUB-AQUEOUS DEPTH, OTHER KEYWORDS:  
DREDGE, SUCTION ; DREDGE INTAKE ; PUMP ; SEABED PIPELINE PLACEMENT
- 3822558 ARCTIC DREDGING AND PIPELAYING  
OTHER KEYWORDS: DREDGE PROPULSION ; ICE PROTECTION ;  
SEABED PIPELINE PLACEMENT
- 3835937 DRILLING AND CUTTING SUBMARINE ROCKS
- 3851492 APPARATUS AND METHOD FOR OFFSHORE OPERATIONS  
OTHER KEYWORDS: EMBEDMENT ANCHOR ; SEABED PIPELINE PLACEMENT
- 3852972 SUBMERGED PIPELINE BURIAL APPARATUS  
OTHER KEYWORDS: SEABED PIPELINE PLACEMENT
- 3857250 UNDERWATER VEHICLE FOR LAYING UNDERGROUND CABLES AND PIPELINES  
OTHER KEYWORDS: SEABED PIPELINE PLACEMENT
- 3877237 UNDERWATER TRENCHING APPARATUS GUIDANCE SYSTEM  
OTHER KEYWORDS: SEABED PIPELINE PLACEMENT
- 3877238 SEA SLED FOR ENTRENCHING AND PIPE BURYING OPERATIONS  
OTHER KEYWORDS: SEABED PIPELINE PLACEMENT
- 3885331 DREDGING BARGE HAVING DIGGING JETS AND STEERING JETS  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE PROPULSION
- 3892079 CONTROL SYSTEM FOR AMPHIBIOUS HYDRAULIC EXCAVATOR  
OTHER KEYWORDS: SEABED GRADER
- 3893404 PULL-AHEAD WINCH CONTROL SYSTEM  
OTHER KEYWORDS: SEABED PIPELINE PLACEMENT ; TOW WINCH CONTROL
- 3926003 BUOYANCY AND ATTITUDE CORRECTION METHOD AND APPARATUS  
OTHER KEYWORDS: SEABED PIPELINE PLACEMENT
- 3952532 UNDERWATER TRENCHING AND CABLE LAYING APPARATUS  
OTHER KEYWORDS: SEABED CABLE PLOW
- 3964184 METHOD OF REMOVING MATERIAL FROM A BED OF A BODY OF WATER  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE PROPULSION
- 3975784 MARINE STRUCTURE  
OTHER KEYWORDS: DREDGE, SUCTION ; DREDGE PROPULSION ;  
OFFSHORE PLATFORM ANCHOR ; OFFSHORE PLATFORM, FLOATING ;  
POLLUTANT DISPERSION ; SEABED PIPELINE PLACEMENT
- 3978679 METHOD AND APPARATUS FOR UNDERWATER TRENCH EXCAVATION.  
AND PIPELINE LAYING. OTHER KEYWORDS: DREDGE, CUTTERHEAD ;  
DREDGE, SUBMERGED ; SEABED PIPELINE PLACEMENT
- 3995439 DEVICE FOR EMBEDDING OBJECTS SUCH AS CONTINUOUS PIPES INTO WATER  
BOTTOMS. OTHER KEYWORDS: SEABED PIPELINE PLACEMENT
- 3999312 WATER JET TYPE UNDERWATER GROUND EXCAVATOR

**SEABED WATER, PROCESS STRUCTURE**

3910058 CONSTRUCTION OF IMMERSED STRUCTURES  
OTHER KEYWORDS: OFFSHORE CAISSON ; OFFSHORE CONSTRUCTION ;  
SEABED PIPELINE PLACEMENT

3996138 MARINE LIFE PROTECTOR

**SEAWALL**

3802205 SEA WALL CONSTRUCTION  
OTHER KEYWORDS: CONCRETE BLOCK ; PILE, STEEL

3820343 SELF-SUPPORTING WALL  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; GROIN ; LOW-COST SHORE PROTECTION

3835651 LITTORAL FLOW TRAP OR BASIN  
OTHER KEYWORDS: BREAKWATER, STEEL FRAME ; BULKHEAD ; GROIN

3846988 SWELL DAMPER  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; OFFSHORE CAISSON

3849990 ANTI-HEAVE PROTECTIVE SYSTEM  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; OFFSHORE CAISSON

3878684 DEVICES FOR PROTECTING THE BASES OF STRUCTURES IMMERSED  
IN A VOLUME OF WATER, AGAINST UNDERMINING. OTHER KEYWORDS:  
BREAKWATER, CONCRETE ; SEABED SCOUR PROTECTION

3890790 ANTI-HEAVE PROTECTIVE SYSTEM

3894397 BEACH EROSION CONTROL STRUCTURE  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; CONCRETE BLOCK ;  
LOW-COST SHORE PROTECTION

3913333 MEANS AND APPARATUS FOR CONTROLLING FLUID CURRENTS AND SELECTIVELY  
PRESERVING AND MODIFYING TOPOGRAPHY SUBJECTED THERETO  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; CHANNEL PROTECTION ;  
DUNE PROTECTION ; SAND FENCE ; TIDAL INLET

3921408 ANTI-HEAVE PROTECTIVE SYSTEM  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; OFFSHORE PLATFORM, FIXED ;  
OFFSHORE STORAGE TANK, EMERGENT

3952520 SHORELINE RETAINING WALL

3953976 SELF-SUPPORTING WALL  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; GROIN ;  
LOW-COST SHORE PROTECTION

3984989 MEANS FOR PRODUCING SUBAQUEOUS AND OTHER CAST-IN-PLACE CONCRETE  
STRUCTURES IN SITU. OTHER KEYWORDS: BREAKWATER, CONCRETE ;  
CONCRETE FORM ; FABRIC MAT ; OFFSHORE CONSTRUCTION ;  
PILE, CONCRETE ; STRUCTURE REPAIR

3995434 WAVE DISSIPATING WALL  
OTHER KEYWORDS: BULKHEAD ; CONCRETE BLOCK

**SEDIMENTATION MEASUREMENT**

3940982 SUBBOTTOM ROCK MAPPING PROBE  
OTHER KEYWORDS: INSTRUMENT, SEABED IN SITU

3975957 SEDIMENT SAMPLING SYSTEM  
OTHER KEYWORDS: SAMPLER, SUSPENDED SEDIMENT

**SEISMIC ACOUSTIC TRANSMITTER ARRAY**

- 3893539 MULTIPLE AIR GUN ARRAY OF VARIED SIZES  
WITH INDIVIDUAL SECONDARY OSCILLATION SUPPRESSION  
OTHER KEYWORDS: SEISMIC EXPLOSIVE ACOUSTIC TRANSMITTER
- 3896898 HIGH FREQUENCY SEISMIC SOURCE USING COMPRESSED AIR  
OTHER KEYWORDS: SEISMIC EXPLOSIVE ACOUSTIC TRANSMITTER
- 3921124 MARINE 3-D SEISMIC METHOD USING SOURCE POSITION CONTROL  
OTHER KEYWORDS: SEISMIC SURVEY METHOD ;  
SEISMIC VIBRATORY ACOUSTIC TRANSMITTER
- 3932835 TOWABLE VLF SONAR PROJECTOR  
OTHER KEYWORDS: SEISMIC STREAMER CABLE ;  
SEISMIC VIBRATORY ACOUSTIC TRANSMITTER ; TOWED BODY DEPTH  
CONTROL
- 3946831 ACOUSTIC TRANSMITTER  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ;  
SEISMIC VIBRATORY ACOUSTIC TRANSMITTER
- 3953826 SUPER LONG SEISMIC SOURCE  
OTHER KEYWORDS: TOW WINCH CONTROL
- 3985199 APPARATUS FOR TIMING THE FIRING OF ENERGY SOURCES  
OTHER KEYWORDS: SEISMIC EXPLOSIVE ACOUSTIC TRANSMITTER

**SEISMIC EXPLOSIVE ACOUSTIC TRANSMITTER**

- 3818440 SEISMIC ENERGY GENERATOR FLOAT  
OTHER KEYWORDS: TOWED VEHICLE
- 3828886 GEOPHYSICAL EXPLORATION APPARATUS
- 3837424 HIGHLY PENETRATING SEISMIC ENERGY SOUND GENERATOR  
WITH PULSE SHAPING FOR OFFSHORE SUBSURFACE  
EXPLORATION
- 3893539 MULTIPLE AIR GUN ARRAY OF VARIED SIZES WITH INDIVIDUAL SECONDARY  
OSCILLATION SUPPRESSION.OTHER KEYWORDS:  
SEISMIC ACOUSTIC TRANSMITTER ARRAY
- 3896898 HIGH FREQUENCY SEISMIC SOURCE USING COMPRESSED AIR  
OTHER KEYWORDS: SEISMIC ACOUSTIC TRANSMITTER ARRAY
- 3908789 METHODS FOR GENERATING AND SHAPING A SEISMIC ENERGY PULSE
- 3915257 AIR CUSHION SEISMIC SOURCE
- 3923122 SEISMIC PNEUMATIC ENERGY SOURCE WITH ATTENUATION OF BUBBLE PULSE  
AMPLITUDE AND REDUCTION OF PERIOD OF BUBBLE OSCILLATION
- 3937296 FIRING DEVICE, EXPLOSIVE CHARGE, METHOD, AND SYSTEM,  
FOR SEISMIC EXPLORATION.OTHER KEYWORDS: SEISMIC SURVEY METHOD
- 3951231 SEISMIC EXPLORATION
- 3952832 PULSED HIGH PRESSURE LIQUID PROPELLANT COMBUSTION  
POWERED SEISMIC SOURCES
- 3968855 SEISMIC MARINE GUN ASSEMBLY
- 3981379 DEVICE FOR EMITTING MECHANICAL WAVES

3985199 APPARATUS FOR TIMING THE FIRING OF ENERGY SOURCES  
OTHER KEYWORDS: SEISMIC ACOUSTIC TRANSMITTER ARRAY

SEISMIC HYDROPHONE

3860899 STRUM NOISE REDUCING DEVICE  
OTHER KEYWORDS: TOWING CABLE

3868624 APPARATUS FOR MAPPING ACOUSTIC FIELDS

3881165 CABLE MOUNTED MAGNETOSTRICTIVE LINE HYDROPHONE

3889230 CAPACITIVE TRANSDUCER AND METHOD OF USING THE SAME  
OTHER KEYWORDS: SEISMIC STREAMER CABLE

3921125 COAXIAL ELECTRET HYDROPHONE  
OTHER KEYWORDS: SEISMIC STREAMER CABLE

3932834 SEISMIC TRANSDUCER ASSEMBLY FOR MARSHY TERRAINS

3939466 SPATIALLY DISTRIBUTED TRANSDUCER FOR TOWED LINE ARRAY APPLICATIONS  
OTHER KEYWORDS: SEISMIC STREAMER CABLE

3961304 DECOUPLED HYDROPHONE WITH REDUCED RESPONSE TO VIBRATION  
AND STRESS CONCENTRATION

SEISMIC HYDROPHONE ARRAY

3840845 METHOD OF INITIATING AND COLLECTING SEISMIC DATA RELATED  
TO STRATA UNDERLYING BODIES OF WATER USING A CONTINUOUSLY MOVING  
SEISMIC EXPLORATION SYSTEM LOCATED ON A SINGLE BOAT USING SEPARATE  
STREAMERS. OTHER KEYWORDS: SEISMIC RECORD PROCESSOR ;  
SEISMIC SURVEY METHOD

3852708 MULTIPLE ELEMENT PHASED ARRAY WITH SHADED SUB-ELEMENT GROUPS  
OTHER KEYWORDS: SEISMIC STREAMER CABLE

3868623 TOWABLE SONAR ARRAY WITH DEPTH COMPENSATION  
OTHER KEYWORDS: SEISMIC STREAMER CABLE ; TOWED BODY DEPTH CONTROL

3893065 HYDROPHONE ARRAY  
OTHER KEYWORDS: SEISMIC STREAMER CABLE

3973236 HORIZONTAL HYDROPHONE ARRAY  
OTHER KEYWORDS: TOWED BODY DEPTH CONTROL

3978446 ELECTRET CABLE HYDROPHONE ARRAY  
OTHER KEYWORDS: SEISMIC STREAMER CABLE

3978813 PROPELLER-DRIVEN HYDROPHONE ARRAY TENSIONING DEVICE  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ; TOWED BODY DEPTH CONTROL

SEISMIC IMPLOSIVE ACOUSTIC TRANSMITTER

3792425 DEVICES FOR GENERATING ACOUSTIC WAVES IN A LIQUID MEDIUM

3895687 ACOUSTIC IMPULSE GENERATOR

3912042 STEAM IMPLoder

3919684 UNDERWATER SEISMIC SOURCE AND METHOD

3944019 DEEP WATER SOUND IMPLoder

3952833 METHOD AND APPARATUS FOR GENERATING PRESSURE WAVES  
IN WATER BY IMPLSION

3997022 DEVICE FOR GENERATING ACOUSTIC WAVES BY IMPLOSION

SEISMIC RECORD PROCESSOR

- 3786408 METHOD AND APPARATUS FOR OFFSHORE GEOPHYSICAL EXPLORATION  
WITH LOW POWER SEISMIC SOURCE.OTHER KEYWORDS: SEISMIC SURVEY METHOD
- 3806863 METHOD OF COLLECTING SEISMIC DATA OF STRATA UNDERLYING BODIES  
OF WATER.OTHER KEYWORDS: SEISMIC SURVEY METHOD
- 3831136 METHOD OF INITIATING AND COLLECTING SEISMIC DATA RELATED  
TO STRATA UNDERLYING BODIES OF WATER USING A CONTINUOUSLY MOVING  
SEISMIC EXPLORATION SYSTEM LOCATED ON A SINGLE BOAT  
OTHER KEYWORDS: SEISMIC SURVEY METHOD
- 3840845 METHOD OF INITIATING AND COLLECTING SEISMIC DATA RELATED  
TO STRATA UNDERLYING BODIES OF WATER USING A CONTINUOUSLY MOVING  
SEISMIC EXPLORATION SYSTEM LOCATED ON A SINGLE BOAT USING SEPARATE  
STREAMERS.OTHER KEYWORDS: SEISMIC HYDROPHONE ARRAY ;  
SEISMIC SURVEY METHOD
- 3887897 SYSTEM FOR CHANGING SEISMIC DETECTION ARRAY LENGTHS  
OTHER KEYWORDS: SEISMIC SURVEY METHOD
- 3939468 DIFFERENTIAL CHARGE AMPLIFIER FOR MARINE SEISMIC APPLICATIONS  
OTHER KEYWORDS: SEISMIC STREAMER CABLE
- 3953827 METHOD OF DETERMINING THE ANGULAR POSITION OF A TOWED  
MARINE SEISMIC CABLE AND APPARATUS FOR CARRYING OUT SAID METHOD  
OTHER KEYWORDS: SEISMIC STREAMER CABLE

SEISMIC STREAMER CABLE

- 3794965 MARINE SEISMIC CABLE BUOYANCY SYSTEM  
OTHER KEYWORDS: TOWED BODY DEPTH CONTROL
- 3812455 MARINE SEISMIC STREAMER CONNECTOR STRUCTURE
- 3852708 MULTIPLE ELEMENT PHASED ARRAY WITH SHADED SUB-ELEMENT GROUPS  
OTHER KEYWORDS: SEISMIC HYDROPHONE ARRAY
- 3868623 TOWABLE SONAR ARRAY WITH DEPTH COMPENSATION  
OTHER KEYWORDS: SEISMIC HYDROPHONE ARRAY ; TOWED BODY DEPTH CONTROL
- 3889230 CAPACITIVE TRANSDUCER AND METHOD OF USING THE SAME  
OTHER KEYWORDS: SEISMIC HYDROPHONE
- 3893065 HYDROPHONE ARRAY  
OTHER KEYWORDS: SEISMIC HYDROPHONE ARRAY
- 3896756 DEPTH CONTROL APPARATUS FOR TOWED UNDERWATER CABLES  
OTHER KEYWORDS: TOWED BODY DEPTH CONTROL
- 3900543 METHOD FOR MAKING A FOAM SEISMIC STREAMER
- 3909774 CONTROLLED BUOYANCY SYSTEM FOR SEISMIC STREAMER SECTIONS  
OTHER KEYWORDS: TOWED BODY DEPTH CONTROL
- 3921125 COAXIAL ELECTRET HYDROPHONE  
OTHER KEYWORDS: SEISMIC HYDROPHONE
- 3926137 DEEP OCEAN PARACHUTE RELEASE  
OTHER KEYWORDS: INSTRUMENT RETRIEVAL
- 3931608 CABLE DEPTH CONTROL APPARATUS  
OTHER KEYWORDS: TOWED BODY DEPTH CONTROL



3932835 TOWABLE VLF SONAR PROJECTOR  
OTHER KEYWORDS: SEISMIC ACOUSTIC TRANSMITTER ARRAY ;  
SEISMIC VIBRATORY ACOUSTIC TRANSMITTER , TOWED BODY DEPTH CONTROL

3939466 SPATIALLY DISTRIBUTED TRANSDUCER FOR TOWED LINE ARRAY APPLICATIONS  
OTHER KEYWORDS: SEISMIC HYDROPHONE

3939468 DIFFERENTIAL CHARGE AMPLIFIER FOR MARINE SEISMIC APPLICATIONS  
OTHER KEYWORDS: SEISMIC RECORD PROCESSOR

3943483 DEPTH CONTROLLERS FOR SEISMIC STREAMER CABLES  
WITH DIMENSION VARIABLE LIFT-PRODUCING MEANS. OTHER KEYWORDS:  
TOWED BODY DEPTH CONTROL

3953827 METHOD OF DETERMINING THE ANGULAR POSITION OF A TOWED MARINE  
SEISMIC CABLE AND APPARATUS FOR CARRYING OUT SAID METHOD  
OTHER KEYWORDS: SEISMIC RECORD PROCESSOR

3961303 DEPTH CONTROLLERS WITH CONTROLLABLE NEGATIVE  
AND UNCONTROLLABLE POSITIVE LIFT-PRODUCING MEANS  
OTHER KEYWORDS: TOWED BODY DEPTH CONTROL

3978446 ELECTRET CABLE HYDROPHONE ARRAY  
OTHER KEYWORDS: SEISMIC HYDROPHONE ARRAY

SEISMIC SURVEY METHOD

3786408 METHOD AND APPARATUS FOR OFFSHORE GEOPHYSICAL EXPLORATION  
WITH LOW POWER SEISMIC SOURCE. OTHER KEYWORDS:  
SEISMIC RECORD PROCESSOR

3790929 SKIP-SPREAD METHOD FOR SEISMIC SURVEYING

3806863 METHOD OF COLLECTING SEISMIC DATA OF STRATA UNDERLYING BODIES  
OF WATER. OTHER KEYWORDS: SEISMIC RECORD PROCESSOR

3831136 METHOD OF INITIATING AND COLLECTING SEISMIC DATA RELATED  
TO STRATA UNDERLYING BODIES OF WATER USING A CONTINUOUSLY MOVING  
SEISMIC EXPLORATION SYSTEM LOCATED ON A SINGLE BOAT  
OTHER KEYWORDS: SEISMIC RECORD PROCESSOR

3840845 METHOD OF INITIATING AND COLLECTING SEISMIC DATA RELATED  
TO STRATA UNDERLYING BODIES OF WATER USING A CONTINUOUSLY MOVING  
SEISMIC EXPLORATION SYSTEM LOCATED ON A SINGLE BOAT USING  
SEPARATE STREAMERS. OTHER KEYWORDS: SEISMIC HYDROPHONE ARRAY ;  
SEISMIC RECORD PROCESSOR

3865062 MARINE GEOPHYSICAL EXPLORATION SYSTEM

3866161 METHOD AND APPARATUS FOR OBTAINING A MORE ACCURATE MEASURE  
OF INPUT SEISMIC ENERGY

3887897 SYSTEM FOR CHANGING SEISMIC DETECTION ARRAY LENGTHS  
OTHER KEYWORDS: SEISMIC RECORD PROCESSOR

3890593 MULTI-DIRECTIONAL SEISMIC EXPLORATION METHODS ON NAVIGABLE WATER

3906352 METHOD OF MAKING A THREE-DIMENSIONAL SEISMIC PROFILE OF OCEAN FLOOR

3921124 MARINE 3-D SEISMIC METHOD USING SOURCE POSITION CONTROL  
OTHER KEYWORDS: SEISMIC ACOUSTIC TRANSMITTER ARRAY ;  
SEISMIC VIBRATORY ACOUSTIC TRANSMITTER

3934220 METHOD OF SEISMIC EXPLORATION FOR PENETRATING DIFFRACTION BARRIERS  
AND/OR SURVEYING BENEATH OBSTACLES

3937296 FIRING DEVICE, EXPLOSIVE CHARGE, METHOD, AND SYSTEM,  
FOR SEISMIC EXPLORATION. OTHER KEYWORDS: SEISMIC EXPLOSIVE  
ACOUSTIC TRANSMITTER

3943484 METHOD OF ATTENUATING UNWANTED SEISMIC REFLECTIONS  
IN UNDERWATER SEISMIC EXPLORATION

3952281 METHOD OF MARINE REFLECTION-TYPE SEISMIC EXPLORATION

3979713 METHOD OF MARINE REFLECTION-TYPE SEISMIC EXPLORATION  
SEISMIC VIBRATORY ACOUSTIC TRANSMITTER

3921124 MARINE 3-D SEISMIC METHOD USING SOURCE POSITION CONTROL  
OTHER KEYWORDS: SEISMIC ACOUSTIC TRANSMITTER ARRAY ;  
SEISMIC SURVEY METHOD

3932835 TOWABLE VLF SONAR PROJECTOR  
OTHER KEYWORDS: SEISMIC ACOUSTIC TRANSMITTER ARRAY ;  
SEISMIC STREAMER CABLE ; TOWED BODY DEPTH CONTROL

3946831 ACOUSTIC TRANSMITTER  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ;  
SEISMIC ACOUSTIC TRANSMITTER ARRAY

3978940 ACOUSTIC SOURCE

3990034 TOWABLE VLF SONAR PROJECTOR

**SLOPE PROTECTION**

3786640 MEANS AND METHOD FOR PRODUCING STEPPED CONCRETE SLOPE STRUCTURES  
OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ;  
LOW-COST SHORE PROTECTION ; REVETMENT ; SANDBAG

3811287 BOTTOM AND BANK FACING  
OTHER KEYWORDS: FABRIC MAT ; SEABED SCOUR PROTECTION

3871182 METHOD OF PROTECTION FOR SLOPES AND CRESTS OF RIVERS, CHANNELS,  
AND THE LIKE. OTHER KEYWORDS: CONCRETE FORM ; FABRIC MAT ; REVETMENT ;  
SEABED MATERIAL PLACEMENT

3874177 POCKET MAT  
OTHER KEYWORDS: FABRIC MAT

3903702 REVETMENT STRUCTURE  
OTHER KEYWORDS: CONCRETE BLOCK ; LOW-COST SHORE PROTECTION ;  
REKETMENT

3922865 MATTRESS, METHOD OF SINKING A MATTRESS AND VESSEL SUITABLE  
FOR USE IN SAID METHOD. OTHER KEYWORDS: CONCRETE BLOCK ; FABRIC MAT ;  
SEABED MATERIAL PLACEMENT

**SMALL-CRAFT LAUNCHER**

3895592 BOAT LIFT  
OTHER KEYWORDS: SMALL-CRAFT SERVICE STRUCTURE

3953980 DOCK STRUCTURE  
OTHER KEYWORDS: PIER, FIXED ; PIER, MOBILE ; SMALL-CRAFT PIER

3967570 FLOATING DOCK BOAT LIFT  
OTHER KEYWORDS: SMALL-CRAFT SERVICE STRUCTURE

3976022 FLOATING DRY DOCK WITH BUOYANCY CONTROLLED AIR INJECTION  
AND VENTING SYSTEM, OTHER KEYWORDS: SMALL-CRAFT SERVICE STRUCTURE

3977030 ARRANGEMENT FOR HAULING UP, LAUNCHING AND STORING OF BOATS  
AND THE LIKE

3978676 SHIP LIFTING APPARATUS  
OTHER KEYWORDS: SMALL-CRAFT SERVICE STRUCTURE

3991695 WATERCRAFT DOCKING  
OTHER KEYWORDS: SMALL-CRAFT SERVICE STRUCTURE

**SMALL-CRAFT MOORING DEVICE**

3788258 MOORING DEVICE

3817201 OUTRIGGER FOR MOORING OF BOATS

3830187 LINE-POST COUPLING AND MARINE MOORING-TOWING DEVICES

3838657 OFFSHORE MOORINGS

3842779 BOAT MOORING AND GUARD DEVICE  
OTHER KEYWORDS: PIER FENDER

3863591 MOORING BAR FOR BOATS

3905322 BOAT MOORING CLEAT

3938462 BOAT MOORING APPARATUS

3948203 MULTIPLE POINT SECURING CLEAT

3961593 DOCK FENDER ASSEMBLY  
OTHER KEYWORDS: PIER FENDER

3971329 MOORING DEVICE

3981261 BOAT DOCKING DEVICE

3996876 MARINE LINE SECURING APPARATUS

**SMALL-CRAFT PIER**

3824796 MOBILE DOCK STRUCTURE  
OTHER KEYWORDS: PIER, FIXED ; PIER, MOBILE

3831538 FLOATING STRUCTURE FOR THE MOORING OF YACHTS AND OTHER SIMILAR CRAFT  
OTHER KEYWORDS: PIER, FLOATING

3861340 FLOATING DOCK STRUCTURE  
OTHER KEYWORDS: PIER, FLOATING

3869532 METHOD OF MANUFACTURING FLOATING BOAT DOCK MODULES  
OTHER KEYWORDS: PIER, FLOATING

3952528 BOAT DOCK STRUCTURES  
OTHER KEYWORDS: PIER, FIXED

3953980 DOCK STRUCTURE  
OTHER KEYWORDS: PIER, FIXED ; PIER, MOBILE ; SMALL-CRAFT LAUNCHER

3967589 FLOATING DOCK  
OTHER KEYWORDS: PIER, FLOATING

3970169 GANGWAY LADDER  
OTHER KEYWORDS: PIER, FLOATING

3977344 FLOATABLE CONCRETE STRUCTURES  
OTHER KEYWORDS: PIER, FLOATING

3999397 MODULAR DOCK SYSTEM  
OTHER KEYWORDS: PIER, FIXED

**SMALL-CRAFT SERVICE STRUCTURE**

3800732 BOAT HULL CLEANING APPARATUS  
OTHER KEYWORDS: FOULING REMOVAL

3820488 UNDERWATER SEWAGE COLLECTION SYSTEM FOR DOCKED BOATS  
OTHER KEYWORDS: POLLUTANT COLLECTION

3857248 PLATFORM LEVELING DEVICE

3895592 BOAT LIFT  
OTHER KEYWORDS: SMALL-CRAFT LAUNCHER

3951087 BOAT DRY DOCKING APPARATUS

3967570 FLOATING DOCK BOAT LIFT  
OTHER KEYWORDS: SMALL-CRAFT LAUNCHER

3976022 FLOATING DRY DOCK WITH BUOYANCY CONTROLLED AIR INJECTION  
AND VENTING SYSTEM. OTHER KEYWORDS: SMALL-CRAFT LAUNCHER

3978676 SHIP LIFTING APPARATUS  
OTHER KEYWORDS: SMALL-CRAFT LAUNCHER

3991695 WATERCRAFT DOCKING  
OTHER KEYWORDS: SMALL-CRAFT LAUNCHER

**SONAR, DEPTH SOUNDER**

3783442 DEPTH SOUNDER

3787802 AUTOMATIC RANGE SWITCHING FOR DIGITAL DEPTH SOUNDERS

3787803 HIGH PERFORMANCE METER DEPTH SOUNDER FOR AUTOMATICALLY INDICATING  
DEPTH WITHOUT MANUAL ADJUSTMENT

3790925 ECHO-SOUNDING APPARATUS HAVING A DIGITAL INTERMEDIATE STORE

3803541 METHOD OF MONITORING OPERATING CONDITION  
OF SUBMARINE CABLE-BURYING DEVICES  
OTHER KEYWORDS: SEABED CABLE FLOW

3852705 SONAR DEPTH TRACKING SYSTEM

3875549 TRANSMITTER TRIGGER CIRCUIT FOR ECHO-SOUNDERS OR SIMILAR DEVICES

3890840 LASER CONTROLLED FATHOMETER  
OTHER KEYWORDS: INSTRUMENT, LASER

3924258 DIGITAL DEPTH SOUNDER

3942149 SOLID STATE DEPTH SOUNDER

**SONAR, SIDE LOOKING**

3800272 ROTATING ACOUSTIC SCANNER SYSTEM FOR POSITIONING OBJECTS  
ON THE OCEAN FLOOR. OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ;  
OFFSHORE CONSTRUCTION ; SEABED SITE SURVEY

3950723 SONAR APPARATUS

3978444 SEAFLOOR MAPPING SYSTEM  
OTHER KEYWORDS: SEABED SITE SURVEY

#### STRUCTURE INSPECTION

3891845 WET ENVIRONMENT RADIOGRAPHY APPARATUS  
OTHER KEYWORDS: INSTRUMENT, RADIOISOTOPE ; PILE, STEEL

#### STRUCTURE REPAIR

3798867 STRUCTURAL METHOD AND APPARATUS  
OTHER KEYWORDS: CONCRETE FORM ; PILE, STEEL

3860987 DEVICE FOR APPLYING A PROTECTIVE COATING TO AN IMMERGED SURFACE  
OTHER KEYWORDS: COATING

3868268 UNDER-WATER SPRAYING  
OTHER KEYWORDS: COATING

3890794 METHOD OF REPLACING PILING  
OTHER KEYWORDS: PILE, CONCRETE ; PILE SECTION CONNECTION ;  
PILE, STRUCTURE CONNECTION ; PILE, WOOD

3934422 PILE SPLICING APPARATUS AND METHOD  
OTHER KEYWORDS: CONCRETE FORM ; PILE, CONCRETE ; PILE, WOOD

3984989 MEANS FOR PRODUCING SUBAQUEOUS AND OTHER CAST-IN-PLACE CONCRETE  
STRUCTURES IN SITU. OTHER KEYWORDS: BREAKWATER, CONCRETE ; CONCRETE  
FORM ; FABRIC MAT ; OFFSHORE CONSTRUCTION ; PILE, CONCRETE ; SEAWALL

#### TIDAL ESTUARY WATER LEVEL

3786638 INFLATABLE DAMS AND DAM UNITS  
OTHER KEYWORDS: CHANNEL BARRIER ; TIDAL INLET

3974654 SELF-REGULATING TIDE GATE  
OTHER KEYWORDS: CHANNEL BARRIER

3993913 TIDEWATER POWER SYSTEM  
OTHER KEYWORDS: CHANNEL BARRIER ; ELECTRICAL GENERATOR ; POWER, TIDE

#### TIDAL INLET

3786638 INFLATABLE DAMS AND DAM UNITS  
OTHER KEYWORDS: CHANNEL BARRIER ; TIDAL ESTUARY WATER LEVEL

3882320 TIDE ENERGY CONVERSION DEVICE  
OTHER KEYWORDS: ELECTRICAL GENERATOR ; POWER, TIDE

3913333 MEANS AND APPARATUS FOR CONTROLLING FLUID CURRENTS  
AND SELECTIVELY PRESERVING AND MODIFYING  
TOPOGRAPHY SUBJECTED THERETO. OTHER KEYWORDS: BREAKWATER, CONCRETE ;  
CHANNEL PROTECTION ; DUNE PROTECTION ; SAND FENCE ; SEAWALL

#### TIDE MEASUREMENT

3869911 WATER CURRENT OR TIDE DIRECTION-OF-FLOW INDICATOR  
OTHER KEYWORDS: CURRENT MEASUREMENT

3933042 WATER LEVEL GAUGE  
OTHER KEYWORDS: WAVE MEASUREMENT

#### TIRES

3834336 FLOATING SPACE FRAME  
OTHER KEYWORDS: PIER, FLOATING

3842606 BEACH-PROTECTORS  
OTHER KEYWORDS: BAR PROTECTION ; LOW-COST SHORE PROTECTION ;  
WAVE ABSORBER BEACH

3884042 FLOATING BREAKWATER  
OTHER KEYWORDS: BREAKWATER, FLOATING ; LOW-COST SHORE PROTECTION

3890917 MARINE FENDERS  
OTHER KEYWORDS: PIER FENDER

3953977 DEVICE FOR DAMPING WAVES  
OTHER KEYWORDS: BREAKWATER, FLOATING ; BREAKWATER, STEEL FRAME

#### TOW WINCH CONTROL

3782319 APPARATUS FOR LAUNCHING, TOWING AND RECOVERING A SUBMERSIBLE  
BODY FROM A VESSEL. OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ;  
INSTRUMENT RETRIEVAL

3893404 PULL-AHEAD WINCH CONTROL SYSTEM  
OTHER KEYWORDS: SEABED PIPELINE PLACEMENT ; SEABED TRENCHER

3953826 SUPER LONG SEISMIC SOURCE  
OTHER KEYWORDS: SEISMIC ACOUSTIC TRANSMITTER ARRAY

#### TOWED BODY DEPTH CONTROL

3794965 MARINE SEISMIC CABLE BUOYANCY SYSTEM  
OTHER KEYWORDS: SEISMIC STREAMER CABLE

3868623 TOWABLE SONAR ARRAY WITH DEPTH COMPENSATION  
OTHER KEYWORDS: SEISMIC HYDROPHONE ARRAY ; SEISMIC STREAMER CABLE

3896756 DEPTH CONTROL APPARATUS FOR TOWED UNDERWATER CABLES  
OTHER KEYWORDS: SEISMIC STREAMER CABLE

3909774 CONTROLLED BUOYANCY SYSTEM FOR SEISMIC STREAMER SECTIONS  
OTHER KEYWORDS: SEISMIC STREAMER CABLE

3931608 CABLE DEPTH CONTROL APPARATUS  
OTHER KEYWORDS: SEISMIC STREAMER CABLE

3932835 TOWABLE VLF SONAR PROJECTOR  
OTHER KEYWORDS: SEISMIC ACOUSTIC TRANSMITTER ARRAY ;  
SEISMIC STREAMER CABLE ; SEISMIC VIBRATORY ACOUSTIC TRANSMITTER

3943483 DEPTH CONTROLLERS FOR SEISMIC STREAMER CABLES  
WITH DIMENSION VARIABLE LIFT-PRODUCING MEANS  
OTHER KEYWORDS: SEISMIC STREAMER CABLE

3961303 DEPTH CONTROLLERS WITH CONTROLLABLE NEGATIVE  
AND UNCONTROLLABLE POSITIVE LIFT-PRODUCING MEANS  
OTHER KEYWORDS: SEISMIC STREAMER CABLE

3973236 HORIZONTAL HYDROPHONE ARRAY  
OTHER KEYWORDS: SEISMIC HYDROPHONE ARRAY

3978813 PROPELLER-DRIVEN HYDROPHONE ARRAY TENSIONING DEVICE  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ; SEISMIC HYDROPHONE ARRAY

#### TOWED VEHICLE

3818440 SEISMIC ENERGY GENERATOR FLOAT  
OTHER KEYWORDS: SEISMIC EXPLOSIVE ACOUSTIC TRANSMITTER

3841156 COMBINED DEPTH INDICATOR AND WATER SAMPLER  
OTHER KEYWORDS: DEPTH PRESSURE MEASUREMENT ; INSTRUMENT, TOWED ;  
SAMPLER, WATER

3953905 STABILIZED, TOWABLE SPAR BUOY  
OTHER KEYWORDS: BUOY, INSTRUMENTED

#### TOWING CABLE

3791480 STRESS RELIEF INSERT FOR FLEXIBLE TOWED ARRAY

3859949 ENVELOPE FOR UNDERWATER CABLE, DRAG ROPES OR THE LIKE

3860899 STRUM NOISE REDUCING DEVICE  
OTHER KEYWORDS: SEISMIC HYDROPHONE

3884173 SUPPRESSION OF CABLE STRUMMING VIBRATION BY A RIDGED CABLE JACKET

3895595 PAIRED CABLE DRAG REDUCTION WITH NON-NEWTONIAN FLUIDS

3899991 WEATHER RESISTANT SEGMENTED FAIRING FOR A TOW CABLE

3940732 BUOYANT ELECTRODE AND SYSTEM FOR HIGH SPEED TOWING  
OTHER KEYWORDS: INSTRUMENT DEPLOYMENT ; SEABED PROPERTY MEASUREMENT

3962982 FAIRINGS FOR CABLES FOR THE TOWING OF AN IMMERSED BODY

3964424 INFLUENCE DETECTING GEAR WITH IMPROVED TOWING CHARACTERISTICS  
OTHER KEYWORDS: INSTRUMENT, SEABED IN SITU ; INSTRUMENT, TOWED ;  
SEABED PROPERTY MEASUREMENT

3990386 PAIRED MULTI-STRENGTH MEMBER TOWCABLE AND ASSOCIATED SEQUENTIAL  
LOAD DISTRIBUTION SYSTEM

#### WATER PLANT REMOVAL

3862537 MECHANICAL ELIMINATION OF AQUATIC GROWTHS  
OTHER KEYWORDS: POLLUTANT REMOVAL WATERCRAFT ;  
POLLUTANT, SUCTION REMOVAL

3867772 METHOD OF EXCAVATING TO FORM OR ENLARGE A WATERWAY  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; DREDGE LADDER CONTROL

3962803 DREDGING HEAD  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; DREDGE INTAKE ; PUMP

3971148 DREDGE CUTTERHEAD  
OTHER KEYWORDS: DREDGE, CUTTERHEAD ; DREDGE INTAKE

#### WAVE ABSORBER BEACH

3842606 BEACH-PROTECTORS  
OTHER KEYWORDS: BAR PROTECTION ; LOW-COST SHORE PROTECTION ; TIRES

3844124 CONTROL OF EROSION  
OTHER KEYWORDS: BREAKWATER, CONCRETE ; CONCRETE ARMOR UNIT ;  
LOW-COST SHORE PROTECTION

3962083 APPARATUS AND METHOD FOR PROTECTING A SHORELINE  
AGAINST CONTAMINATION FROM AN OIL SPILL. OTHER KEYWORDS:  
FABRIC MAT , POLLUTANT ABSORPTION ; POLLUTANT, MECHANICAL REMOVAL

#### WAVE PLUME

3802697 WAVE GENERATOR FOR SIMULATED SURPRIDING  
OTHER KEYWORDS: WAVE GENERATOR

3913332 CONTINUOUS WAVE SURFING FACILITY  
OTHER KEYWORDS: WAVE GENERATOR

WAVE GENERATOR

3789612 METHOD OF SURF GENERATION  
OTHER KEYWORDS: HYDRAULIC MODEL BASIN

3802697 WAVE GENERATOR FOR SIMULATED SURFRIDING  
OTHER KEYWORDS: WAVE FLUME

3827290 STREAM TABLE STUDY CENTER  
OTHER KEYWORDS: HYDRAULIC MODEL BASIN

3837094 WAVE GENERATING APPARATUS FOR STUDY OF WAVE PHENOMENA  
OTHER KEYWORDS: HYDRAULIC MODEL BASIN

3913332 CONTINUOUS WAVE SURFING FACILITY  
OTHER KEYWORDS: WAVE FLUME

3973405 SURGE GENERATORS OF THE PLUNGER TYPE

WAVE MEASUREMENT

3785203 WAVE FORCE TRANSDUCER  
OTHER KEYWORDS: PILE LOAD MEASUREMENT

3800601 SEA SENSOR AND DESCRIPTOR SYSTEM  
OTHER KEYWORDS: BUOY, INSTRUMENTED

3874237 LIQUID LEVEL HEIGHT MEASURING APPARATUS

3910111 WAVE HEIGHT MEASURING DEVICE  
OTHER KEYWORDS: OFFSHORE PLATFORM, FLOATING

3933042 WATER LEVEL GAUGE  
OTHER KEYWORDS: TIDE MEASUREMENT

3955412 WATER CURRENT FORCE MEASURING APPARATUS  
OTHER KEYWORDS: BUOY, INSTRUMENTED ; BUOY MOORING SYSTEM ;  
CURRENT MEASUREMENT

3983750 FLUID LEVEL SENSING DEVICE  
OTHER KEYWORDS: BUOY, INSTRUMENTED

WIND MEASUREMENT

3869913 METHOD AND APPARATUS FOR DETERMINING SURFACE WIND VELOCITY  
OTHER KEYWORDS: INSTRUMENT, AIRBORNE



Ray, Robert E.

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